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The dream of fast Internet access via ADSL can only be a reality if contention ratio problems are solved

Congestion and contention

I've recently had ADSL installed at home and I have to say that I was very nervous about the experience. Several colleagues have had ADSL installed and have fed me horror stories about how long it took and how many problems they had. I was, therefore, very apprehensive as I waited for BT to arrive. I took the day off work because I could only narrow down BT's time of arrival to early or late halves of the day, but thankfully the engineers turned up while it was still morning. I was surprised to see that they had brought a USB ADSL modem with them, since everyone else I knew had been given the Ethernet installation. I was even more surprised that after just 30 minutes, the modem was installed and everything set up. OK, so we had to do everything on my PC because both the engineers' laptops refused to perform, but on the whole the experience was pretty painless.

There was a bit of a problem getting my correct user-id and password from BT OpenWorld, but once that was resolved I was basking in the joys of high-speed, always-on, Internet access. The first thing I did was frantically search for large files to download, so I could find out just how fast my new toy was. Within a few minutes I was downloading three movie trailers simultaneously, one was downloading at 55Kbytes/sec with the other two still speeding along at around 26Kbytes/sec. Now this is the kind of Internet performance I have been dreaming of for as long as I can remember. Obviously, I'll still be limited by the speed of the server I'm downloading from, but I knew I'd entered the next level of home Internet access.

The next experiment had me firing up Quake III Arena to try a bit of online deathmatch action. I had already obtained a couple of server addresses but I soon found out that I needn't have bothered. Bringing up the multiplayer screen presented me with a huge list of active servers from which I could take my pick. Having tried to play Quake III online before via a 56K modem I wasn't expecting the best, but what I got was a playing environment every bit as smooth and fast as playing over a dedicated LAN. After playing a few rounds it was very clear to me that broadband access is key to the success of both consumer IT and convergence technology. But this thought brought me back to a conversation I'd had at the ECTS show in September. A representative from a large gaming website was telling me about plans to start selling downloadable games over the web. After I pointed out to him that I couldn't see too many consumers waiting for a whole game to download via their 56K modem, he stressed that they were banking on widespread uptake of ADSL. In fact, he insisted that ADSL was going to make selling large downloads online not only a reality but the preferred way to purchase.

Now, in principle he was right, if everyone had access to a high-speed Internet connection, being able to buy something instantly, without having to wait for postage or wander around the shops is quite an attractive prospect. But what he failed to take into account was the contention ratios employed by ADSL. At the moment, my link is lightning fast since I'm probably one of the

> **If we want every household to sign up for broadband access it has to OFFER HIGH BANDWIDTH no matter how many people in your street are online**

only households in my area to have it. But if it does become as popular as this guy seemed to think it would, the performance will go through the floor with more and more people sharing the bandwidth.

Of course, even with a high contention ratio the speed of your connection will probably be dependent on what time of day you're using it, but ultimately, if we want every household to sign up for broadband access it has to offer high bandwidth no matter how many people in your street are online.

It's hard to say what will be done to solve this potential problem, but as things stand, the few who have got an ADSL connection can enjoy very fast Internet access. Hopefully, as more people sign up, some of the money made from subscriptions will be put towards increasing the amount of lines and lowering the contention ratios.

That way, the dream of every household having a lightning-fast connection to the Internet could be a reality.

Riyad Emeran, Editor

PERSONAL COMPUTER WORLD

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SUBCRIPTION & BACK ISSUES PRICES

UK (inc P&P)	CD version	DVD version
Three-year subscription	£57.19	£99.99
One-year subscription	£24.95	£39.99
Back issues	£5	£7
Cover disc (DVD) only	N/A	£2.50

Overseas (airmail)		
Europe (one year)	£95	£105
Rest of the World (one year)	£125	£135

Original design WB Associés, Paris
Origination Westside Digital Media,
32 Great Pulteney Street, London W1R 3DE
Printed St Ives plc, Plymouth
Distributed Marketforce (UK) Ltd,
247 Tottenham Court Road, London W1P 0AU

vnu business publications

ABC
133,361
Jan-July 2000

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WELCOME TO THE DECEMBER 2000 PERSONAL COMPUTER WORLD COVER DISCS

December COVER DISCS

GAMES | **APPLICATIONS** | LIBRARY | ENTERTAINMENT | INTERNET

Welcome to the December *PCW* CD-ROM. We've got no fewer than four full programs – Focus Route Finder, Serif WebPlus, IntelliCAD 2000 Light and Eye2eye London – plus some great new playable games demos and trial software and utilities. That's all on the CD – if you're fortunate enough to have bought the DVD-ROM edition, there's all this and megabytes more (DVD-specific content on page 20).

Focus Route Finder – UK & Ireland FULL VERSION

Planning a journey can be a nightmare when you know you'll hit traffic trouble spots! Endlessly ploughing through atlases and maps trying to find alternative routes can be really painstaking. But Focus Route Finder – UK & Ireland can put an end to such dilemmas, providing you with fast, no-fuss solutions. The package is an up-to-date route planner for road users. Powerful yet easy to use, with an intuitive interface and clear buttons, it is perfect for planning all leisure and business journeys by road.

● The package covers the UK and the whole of Ireland, including the latest road networks.
● You can print out your chosen route and keep it in the car for future reference.
● It covers 35,000 locations and 180,000 miles of road.
● There are five levels of route information.
● A 'Zoom' facility on the map section helps you home in on destinations.
● All road network information comes from AND Mapping, the leading supplier of European digital mapping data to government and industry.

To get started, simply enter the start location and destination of your journey (using place names or UK postcodes) and within seconds Route Finder will calculate your optimum route and alternative journey plans. It will also calculate approximate time of arrival and mileage. If you're travelling to several places, simply click on the 'via' option and select as many destinations as you require. Whether you are trying to locate very distant places, or you are planning and costing a trip for business or pleasure, Route Finder – UK & Ireland will fit the bill.

Easy to use
Simply type the first few letters of the place name or UK postcode (UK & Ireland version only) to enter your start, via and destination locations, and Focus Route Planner – UK & Ireland will calculate the best route.
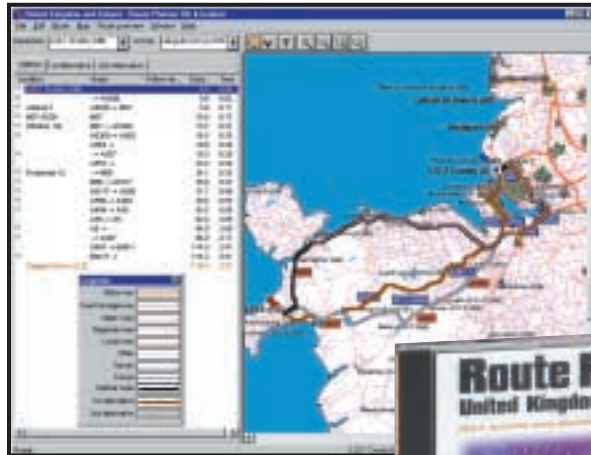
Left: The package covers 350,000 locations and 180,000 miles of road
Below: All road information is supplied by leading European supplier AND Mapping
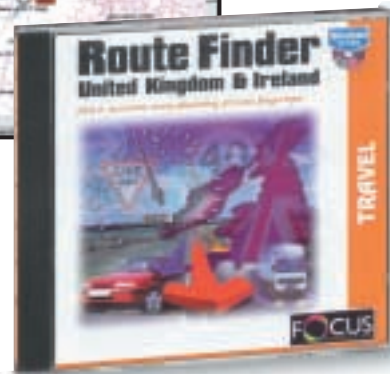
Fast
In just seconds, Focus Route Planner – UK & Ireland clearly displays the fastest optimum route (with alternatives where applicable) on screen and in full colour. You can print both the route description and the map to take with you on your journey.

Up to date
The road networks used in Focus Route Planner – UK & Ireland products are continually updated by AND Mapping, Europe's number one supplier of digital road information to commerce and industry. AND Mapping is an ISO-9002 certificated organisation.

Calculation of route information is based on road networks, which are a combination of road segments. Focus Route Planner – UK & Ireland contains information on the type of road making up each road segment, for example motorways, as well as information on the average speed of traffic travelling on these segments. Each type of road is also associated with a given priority based on the desirability of travelling on the type of road involved. When determining the quickest route, the application takes the priority associated with the various roads into account, as well as the average speed on the various types of roads. The average speeds and priorities associated with the various roads cannot be changed.

The average speeds used within the program are:
● Motorways: 63mph (in towns: 37mph)
● Dual carriageways: 43.5mph (in towns: 25mph)
● A roads: 38mph (in towns: 22mph)
● B roads: 31mph (in towns: 19mph)
● Local roads: 25 mph (in towns: 16mph)
● Other roads: 19mph (in towns: 13mph)
● Ferries: 9.5mph.

Serif WebPlus

FULL VERSION

Serif WebPlus is the quickest and easiest way to get a website up and running. There are two reasons for this: First, Web Wizards for Instant Web Sites allow you to choose from professionally designed site schemes, provides some basic information, and then customises the web pages to suit your needs. The Layout Checker helps you to fine-tune your design for most efficient web use. Then you can preview your site in your own web browser and publish it straight to the web.

Second, with Easy Editing and Effects it's a snap to import your own text and graphics to replace the wizard samples. You'll find built-in modules like WritePlus, for integrated word processing, plus tools for creating text hyperlinks and hotspot graphics. Choose the colour scheme that looks best... The Snapping feature and Dot Grid help you achieve a crisp layout.

Everything's wrapped into a friendly DTP environment with on-screen Tooltips, HintLine, and context-sensitive help.

The Full Edition on this month's CD-ROM includes the following features:
- **A full complement of Web Wizards**
Choose from dozens of professionally designed wizards with a variety of colourful themes.
- **Amazing logo and draw-type graphics module**
Create instant, colourful logos and draw-type graphics using Serif's exclusive LogoPlus creation tool.
- **Animated gif wizard and animation library**
Add life to your web pages! Choose from animated animals, cartoons, dingbats, logos, objects and more.
- **Animated marquee wizard**
Custom-design your own varied and

Left: LogoPlus creates instant, colourful logos and draw-type graphics
Below: Web Wizards for Instant Web Sites allow you to choose from a collection of professionally designed site schemes with a variety of colourful themes

colourful multi-line text messages that will then scroll across the screen.
- **Spell-checking and thesaurus**
Enhance your proofreading potential and ensure your site's readability with these built-in support tools.
- **Direct import of TWAIN digital images**
Now you can use your digital camera or scanner to bring in your own images, adding greater sophistication to your website pages.
- **Direct Kodak PhotoCD Support**
Use a convenient gallery browser to view thumbnail images using this very popular picture format.
- **Publish to any web host**
Take advantage of unlimited, direct uploading if you are planning to publish your website to a server other than VisualCities.
- **Learning WebPlus**
For a handy guide that will help you get started using web wizards to create and publish a basic site, and background information for those new to the web, step through the WebPlus Companion.
- **Creativity**
Even if you've used a web wizard to create your site, there are lots of creative choices to be made. While the wizards simplify your design tasks considerably, the chances are you'll want to put your personal stamp on the site before publishing it.

Serif PagePlus 6 for £19.95!

PagePlus 6 (MSRP £99.95)
You can benefit from superior web and paper publishing tools. Everything you need to create professional-looking publications – fast!
Features include:
- The much-requested Multiple Document Interface
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- Automatic colour schemes
- Ingenious multiple document types
- Intelligent gallery objects
- Time-saving on-screen studio panel
- Superior web publishing
- Supports HTML for enhanced WYSIWYG
- Multimedia-rich web capabilities
- Enhanced wizard functionality

DrawPlus 5 (MSRP £99.95)
After almost two years of continued development and research into what you really want from a top-class drawing and graphics package, Serif is

pleased to announce the release of its most powerful product yet: DrawPlus 5.
Features include:
- Chains (artistic lines)
- Transparency effects
- Auto-connecting lines
- Rollover buttons
- Natural curve editing

Personal Computer World readers should call our **Sales Order Hotline on 0800 376 4848** to get PagePlus 6 (two CDs) for just £19.95. (User manual available for a further £10).

Offers on DrawPlus 5 and other products will be available when you call our special order hotline. All prices include VAT but exclude shipping and handling at £6 per order.

READER OFFER

Atlas IntelliCAD 2000 Light

FULL VERSION

IntelliCAD 2000 is the intelligent choice for architects, engineers, designers – virtually any professional who creates or uses CAD drawings.

Here are some of the reasons IntelliCAD* is perfect for CAD professionals. (***describes full product – some features may be missing in Intellicad 2000 Light**).

● **Unrivalled Autodesk AutoCAD compatibility**
IntelliCAD's native file format is .dwg, so when you open an existing Autodesk AutoCAD file (v2.5 through 2000) there's no file conversion and no data loss. IntelliCAD also provides a high degree of compatibility with the AutoCAD command set, as well as AutoLISP and ADS. That means you can get to work immediately using the AutoCAD files, commands and

applications you rely on. IntelliCAD 2000 includes key R14 features not included in IntelliCAD 98, such as Associative hatch and TrueType fonts, adds AutoCAD 2000 file format compatibility, and has completely rewritten DCL support.

● **Exceptional productivity**
IntelliCAD offers smooth Microsoft Windows integration plus many unique productivity features, including the ability to open multiple drawings at once; a Drawing Explorer that lets you review and exchange drawing content with drag-and-drop ease; and visual customisation of menus and toolbars – no programming required! And thanks to its ActiveX integration, you can insert IntelliCAD drawings (or just parts of them) into a Microsoft Office application file or a Visio 2000 Technical Edition schematic.

● **Affordability**
For the first time ever, you can buy a heavy-duty CAD program that's compatible with the .dwg file format and AutoCAD applications at mass-market pricing. Other feature-rich, low-cost CAD programs have tried to create their own standard as opposed to leveraging the existing .dwg standard.

IntelliCAD's low price makes it affordable to anyone who creates and uses .dwg files.

Productivity features include:
● Photo-realistic 3D rendering (optional)
● ActiveX support including in-place editing
● Drawing Explorer for managing layers, blocks, line types, and more
● Graphical block preview
● Work with multiple open drawings (MDI)
● Real Time Pan & Zoom
● Right-mouse click to edit properties of multiple selected entities
● Script recorder
● Unlimited undo/redo
● Visual Basic for Applications (VBA)
● Visual customisation of menus and toolbars

System requirements: Microsoft Windows 95/98/NT4; 486/66 processor (minimum); Intel Pentium processor or greater (recommended); 32MB of RAM (minimum), 64MB of RAM (recommended) for Windows 95/98 or Windows NT; 50MB of free hard-disk space for a full installation, including sample files, electronic documentation, and online Help; CD-ROM drive (for installation only).
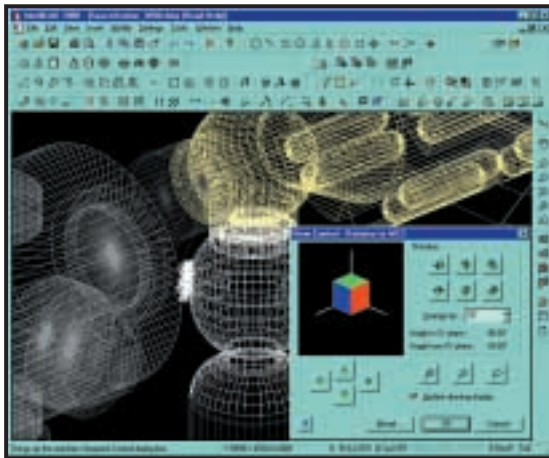
Light version

The Light version of IntelliCAD is fully-functional, and comes with all the power and great features of the standard version of IntelliCAD 2000, apart from the following: Programming interfaces, ie VBA, LISP, SDS not included; optional rendering module is not included; the optional raster image display is not included; an ad for a special upgrade to the standard version of IntelliCAD 2000, for *PCW* readers only, is displayed on starting the program and once an hour.

Using the cover disc

The *PCW* cover disc uses a web-browser-style interface. As well as cutting the time needed for development, content designed for the web can be easily ported to the disc (and vice versa).

Compatibility issues are reduced as your browser has been installed to work on your individual PC. However, to get full functionality from it, you will need to use Microsoft Internet Explorer (version 4 or later). This is because we use a special ActiveX plug-in that allows us to install software directly from the browser, without all the normal options, dialogs and security warnings.

Unfortunately, Netscape doesn't properly support this software. For non-Microsoft users, we've included a small installer that will run when you insert the disc, or when you run the program PCW.EXE in the root of the disc. Of course, you can still launch the main browser to read all about the software on this month's disc.

IMPORTANT

Please note that we cannot give support on individual programs contained on this disc. Should you have problems running the disc or any of its content, please note the following guidelines:
● Faulty disc (ie, the disc is physically damaged and will not load) – return the disc for a replacement to: PCW December cover disc, TIB plc, HelpLine Returns, Unit 5, Triangle Business Park, Pentrebach, Merthyr Tydfill, Mid Glamorgan CF48 4YB, quoting ref 'PCW Vol 23 No 12'
● You have problems installing/running the software. Check the support page on the CD, or the support website at www.pcw.vnunet.com/cd. You should also check the manufacturer's website
● For general difficulties call 01685 354726
● If you're still stuck, drop us an email at pcwcd@vnu.co.uk – we may be able to help.

Eye2eye... Airfix Dogfighter... and more

Eye2eye

Explore London in comfort with Eye2eye London – a full product, worth £9.99. Travel round the city through 403 full-screen photos. See its attractions, royal heritage, government and business... the list is almost endless. Next, leave the capital and take a quick round-the-coast trip to see Britain's furthest points.

Eye2eye Britain

Eye2eye London is a sister product to the Eye2eye Britain CD-ROM, with the same armchair travel system, all its innovative features such as stepping to explore, animated slideshow journeys and printing enabled, and no time limit.

It covers both Central and Greater London, plus the tips of Britain at Land's End, John O'Groats and other regions. An on-screen holiday!

For £39.99 inclusive, upgrade to the Eye2eye Britain CD-ROM, covering the whole of mainland Britain with 10,000-plus images of 3,000-plus places, including the entire coast and virtually all towns and cities.

Technical requirements for Eye2eye London:

- A multimedia PC with Windows 95 or 98
- 16MB or more of RAM (32MB+ recommended)
- Pentium 75 or faster processor (166+ recommended)
- 41MB or more hard disk space
- SVGA display at least 800 x 600 in High (16bit) or True (24bit or 32bit) colour
- A mouse or compatible pointing device

To uninstall: Use the Add/Remove Programs window from the Control Panel.

Limitation: A smaller, sister product to Eye2eye Britain, covering Central and Greater London, plus regions at Britain's coastal points (Land's End and John O'Groats).

Upgrade instructions: These are included in the software (£39.99 including VAT and P&P)
www.eye2eyesoft.co.uk

Airfix Dogfighter

The year is some time shortly after the Second World War. It's time for a miniature yet devastating battle between the real powers of this corner of imagination.

This is your chance to prove your skills piloting a miniature Airfix plane around the troubled skies above the living room and beyond. A bizarre concept, maybe, but one that makes for an original and playable new flight sim.

Deepfighter

Deep Fighter is the stunning new underwater shooter-puzzler from respected Britsoft developer Criterion Studios. Pilot your fighter submarine to victory through a series of deadly missions in this original underwater action adventure.

Your task is to protect your colony from the imminent threat of natural disaster and the mysterious enemies that inhabit this beautiful but deadly underwater world.
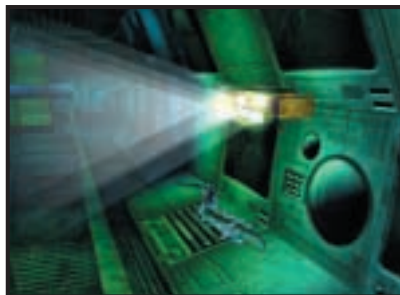
Above: Pilot your sub through a series of deadly missions in Deepfighter from Criterion Studios
Right: Take control of Cassandra and defend artificial planet Gromada from alien invaders

Superbike 2001

This is the officially licensed game of the World Superbike Championship. This demo just gives you a taste of the full game whose features include: full championship mode across all 13 tracks, all accurately modelled down to the last detail; all official teams and all 25 riders from the Championships; legendary machines such as the Ducati 996, Honda RC45, and Kawasaki ZX-7RR; and world famous riders such as Carl Foggarty and Aaron Slight; realistic bike physics; advanced artificial intelligence.

Computer opponents are aggressive, performing overtaking manoeuvres, avoiding obstacles and riding right on the bike's limit. There are various difficulty levels and rider assistance – increase realism as you increase your skill. Split-screen mode allows you to have a one-on-one duel with a friend. You can also join your friends with six-player multiplayer mode over a LAN or the Internet.

Gromada

Gromada is an artificial planet built as a testing site for new battle machines. But now it has been attacked by aliens who have taken control of all the battle machines on the planet but one, Cassandra, an advanced tank with unlimited battle capabilities. You must regain control of the planet and destroy all enemy units and the mutated alien plants that have colonised the planet.

e-taxchecker... Obliterator... and more

e-taxchecker free-taxchecker

Time is running out. If you are one of the growing number of taxpayers who has to submit an annual tax return, don't miss the deadline or you'll end up paying a penalty. Tax returns can be complicated to fill in, but help is at hand – you can use free-taxchecker to complete your Inland Revenue Self Assessment Income Tax Return.

On the disc is a shortened version of e-taxchecker.com, which has been introduced as an alternative to the Revenue's program for taxpayers who wish to use software produced by one of the UK's independent tax consultancy firms, ACM. It has some of the functionality of the main program, e-taxchecker.com, but in common with other 'free' software it is restricted in that the more complex parts of the program have been removed in order to allow downloading over the Internet.

You will find helpful tax tips available simply by using a right mouse click on the relevant question and you will have direct access to obtain a review of your data prior to submission to the Inland Revenue – to make sure that you have correctly completed your return.

free-taxchecker has been tested and passed through the Inland Revenue's Third Party Validation Service and is suitable for transmission of electronic data using the Inland Revenue's 'File By Internet' service.
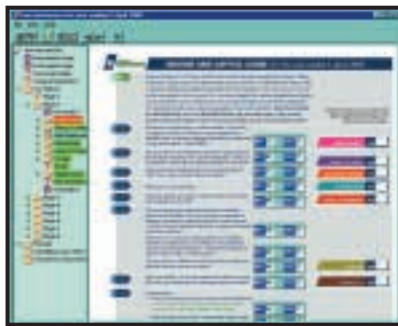
QuizMenu

Test your knowledge and memory with this amusing quiz.

Nine of the included quizzes contain 100 questions. Science and Misc.Sport contain 50. You can even create your own quizzes. This Shareware version of the program will only ask 30 questions in any quiz. Those who register will receive the fully enabled version.
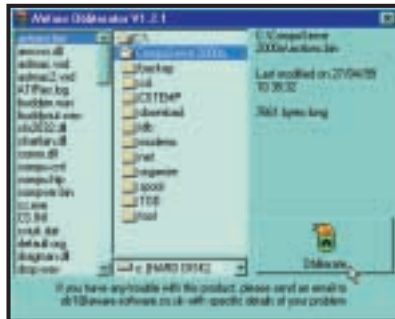
Obliterator v1.2.1

Even after formatting, with the right software tools it's possible to recover data deleted from your hard disk. If you have sensitive information on your PC, AWare's Obliterator is a simple and fast method for removing confidential files from your PC (currently Windows 95 only). All the characters in the file are replaced with spaces before it is deleted.

NOTE: You may need to install the Aware Support Pack 1 (which includes msvbvm60.dll) BEFORE installing Obliterator.

INVU Information & Document Manager (trial)

INVU is designed to manage all applications and information on the desktop. Most users want a simple way of calling up their favourite applications such as Microsoft Word or Excel, scan in paper documents and then manage all the data received or produced for instant access in the future. INVU supports any Windows application.

Therefore, whether you produce letters, spreadsheets, technical documents and drawings, designs or any other type of document INVU manages this information for you.

Please note, due to space restrictions, the INVU installation doesn't include Internet Explorer 5 – you should install this separately if required.

InfoRecall 2000 (trial)

Recall information at the push of a button. Speed search all your storage devices... hard drive, discs, CDs, computers on a network. And you can dump information in any way you choose – scan it in, type it in, dump it in from disks, drag it in. You can even pour it in with no structure, no fields. And you'll still be able to retrieve it instantly, as long as you can remember any one word within the data. InfoRecall will save you time, headaches, money, and frustration. Visit Phantech's website for further information (www.phantech.com).

Speednet 4.1 (30-day trial)

Speed up your Internet connection. By fine-tuning your system settings, SpeedNet claims to double or triple your existing download speeds. Speednet will also resume downloads. Simply enter the location of the file and SpeedNet will attempt to resume the download from where it left off. With SpeedNet's new IP Resolving utility, you enter the address of the site, and SpeedNet does the rest. It also includes a 'stay connected' feature, as well as intruder interception.

Sound files

On September's *PCW* CD-ROM we had to omit some of the sound sample files for **Music Maker** for space reasons. We included those designed for playback at 100bpm (beats per minute), 120bpm, and 140bpm, but not those at 160bpm. Well, here they are at last, on this month's CD. You'll find them in the Soundp30 folder on the root of the CD-ROM.
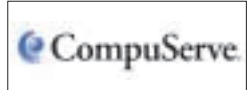
What's on the DVD

If you've bought the DVD-ROM edition of *Personal Computer World*, you'll find ALL the great programs that are on the CD edition, PLUS the gigabytes of additional software, described below.

Blender 2 – the gameBlender

Created by Ton Roosendaal, co-founder of Neo-Geo in Holland, Blender was originally devised as an in-house development tool, allowing for the creation of linear graphics as well as commercial quality 3D animations. As a functional and professional design suite, Blender offers the same high-end tools as other existing programs such as Studio 3D Max, or Maya, yet costs absolutely nothing, compared to the thousands of pounds that normally need to be invested to use these other programs.

We've included versions of Blender 2 for Windows, Linux, BeOS, Sun and SGI, as well as some fabulous examples and a comprehensive online user guide.

Corel Presentations

This full ESD version for Windows of Corel Presentations lets you create high-quality slide shows and drawings that can include text, data charts, organisation charts, and graphic objects.

You can use Corel Presentations to produce professional-looking project proposals, interactive demonstrations, multimedia presentations, flyers, signs, banners and more.

Your slide shows can be presented on large monitors, portable computers, overhead transparencies, 35mm slides, or printed in colour or black-and-white. You can also send your presentations to other people over the Internet.

This electronic software distribution (ESD) of Corel Presentations 9 (pictured below) is a complete version of the award-winning application.
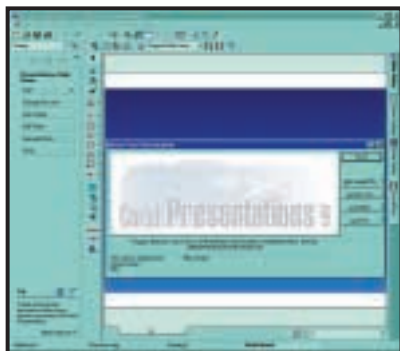
Corel Linux OS 1.0

For those without a CD burner, we've included Corel Linux v1.0 (download version). It's not the latest , but it does have the advantage that you can create a boot floppy disc and run the installation directly from this DVD-ROM. You may find that, if your PC is very recent, Corel Linux doesn't include all the necessary drivers. Visit the Corel Linux website (www.linux.corel.com) for more information. When you have read the installation notes, run the program Create_Boot_floppy.exe which you will find in the \Corel\ folder on this disc. When the dialog box appears, follow the directions to boot from a floppy disk and create a boot floppy. Your system will now restart and Corel Linux Install Express will start.

Corel Photo-Paint 9 for Linux

Corel offers this powerful award-winning photo-editing and painting software free to the Linux community. Ensure that you read all the instructions on the disc carefully before downloading/copying and installing.

Corel WordPerfect 8 for Linux

This version allows unlimited usage for personal, non-commercial use, provided you register as a user within 90 days. Features include: Multi-language support; Import/ Export Filters – including support for Office 97 document formats.

SuSE Linux 7.0

This latest live-file version of SuSE Linux runs straight from CD-ROM, so you don't have to partition your hard disk. It's ideal for newcomers to Linux. SuSE v7 is a pre-configured graphical Linux operating system. You will need a CD writer as SuSE Linux is supplied as an ISO 9660 image file. Once burnt onto the CD-R, you simply boot your system with the new disc in your CD drive, and follow the on-screen instructions. SuSE copies several files on your hard disk occupying around 150MB in total. These provide your configuration settings and so on. Everything else stays on the CD. If you wish to remove SuSE, you can delete these files (or you can simply remove the SuSE CD from the CD-ROM drive at boot).

Burnt Cookies

Advertisers on the web can place cookies on your computer, but Burnt Cookies allows automatic detection and optional deletion of cookies deposited by banner ad websites, working in conjunction with Microsoft's Internet Explorer (3.02 or later).

Playable games demos

● **No One Lives Forever (technology demo)**
Enter the cloak and dagger world of villains and superspies, circa 1967. As Cate Archer, you must protect humanity from twisted madmen bent upon world domination.

● **Delta Force: Land Warrior**
This demo includes one single-player mission that features 'Gas Can', one of the five characters from the full version. Fight your way into the pyramids and recover a briefcase containing deadly bio-toxins.
● **Delta Force 2**
This new demo includes one single-player mission and four multiplayer games. You have to penetrate and eliminate enemy security forces, recover the code book and destroy the communications centre.
● **Echelon (video)**
Echelon is a military aircraft sim set in the distant future. The player is a pilot of the Galactic Federation, defending a planet attacked by rebels in possession of secret alien technology which, they hope, will help them to overcome the Federation and conquer all the surrounding worlds.
● **Horde: Northern Wind**
This is a strategy game based around Russian folk stories. The hero and his warriors set up a settlement, develop it economically and build an army to protect themselves from aggressive neighbours.
● **Homeworld: Cataclysm**
Set in the Homeworld universe, take command of a new sect with dozens of ships and technologies at your disposal, as you lead your fleet through 17 single-player missions against the might of a powerful techno-organic foe. Check out the demo.

Starting the DVD-ROM

The DVD should auto-start, just like the CD. If it doesn't, double-click the DVD-ROM icon in My Computer or, alternatively, run the file pcw.exe on the root of the DVD. Check out the support website at www.pcw.vnunet.com/cd for late-breaking news on the programs on the disc

contents

Psion's DAB hander opens new route for mobile data

Psion will produce a portable smart digital radio as early as next year, offering the prospect of a secondary data source for cellular mobile devices.

Chairman David Potter announced the move at the launch of a USB version of its Wavefinder digital radio, which connects to the USB port of a PC.

The Wavefinder has 600 components and Potter said more integration would be needed to make the device mobile. The portable version will be followed by one with a two-way cellular mobile.

Most major radio stations offer Digital Audio Broadcasting (DAB) signals, which can deliver data as well as high-quality audio. There is scope for delivering the kind of local data that has long been seen as a potential source of revenue for WAP (wireless application protocol).

Psion sees DAB as being complementary, rather than a threat, to WAP-like services. But DAB could affect 3G (third-generation) networks at a time when their viability, given huge start-up costs, is being questioned.

The big question is whether Psion can make a DAB handheld small and cheap enough for a mass market. The device needs to include an aerial and considerable processing power; add a colour screen and a GSM or 3G module and you have a hefty power drain.

But there will be market impetus from the car industry as DAB promises much better car-radio reception. Clever processing makes a virtue of 'multi-path propagation' – bouncing radio signals, which can cause fading.

The potential synergy between DAB broadcasts and two-way point-to-point cellular is similar to that between the fixed Internet and satellites.

But TV broadcasters have other priorities. Nick James, head of new product development at BSkyB, said: 'We remain focused on providing television and interactive television services rather than distract ourselves with the delivery of pure data.'

He was speaking after the launch of TiVo, a smart TV recording system that enables you to pause viewing as if you are using a VCR. TiVo includes an electronic programme guide (EPG) costing a one-off £199 or £10 a month.

TiVo is doing for TV what smart receivers can do for radio; EPGs may well be the next big area for software development. *Wavefinder review page 96; WAP Special page 41; PDA group test see page 198.*
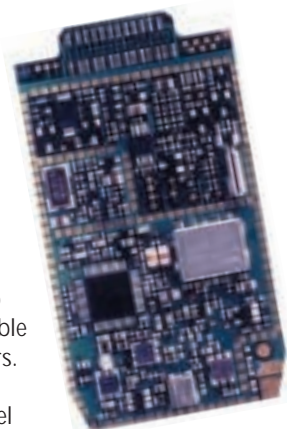
P4 launch delayed

The launch of the Pentium 4 has been delayed due to problems with the 850 chipset, according to web reports.

The new chip had been expected to appear in late October, though an Intel spokesman stressed that it was promised only 'in the fourth quarter'.

The company could be forgiven for being cautious following a series of glitches over the past year.

The P4 is likely to be out before Christmas. In the past Intel has been slated for launches that render PCs bought only days before as Christmas presents out of date. But the P4 is not aimed at the consumer market.

Intel has launched two mobile Pentium III chips, running at 800MHz and 850MHz, as well as a mobile 700MHz Celeron. *Intel drops Timna, see page 36.*

GSM goes way of PCs

Wireless devices are going the way of PCs, with vendors assembling standard modules from a variety of manufacturers, according to French wireless specialist Wavecomm.

The device pictured, the latest version of the Wismos (wireless standard modules), is the mobile equivalent of a PC motherboard. It can give plug-in dual-band GSM and GPRS functions to devices from laptops to remotely-readable electricity meters.

Wavecomm chairman Michel Alard said the same functionality will be available in a 43 x 32 x 4.5mm cartridge by the end of the year. A still smaller UMTS cartridge will be available in 2002. Prices will drop by around 15 per cent per year to about £50 a module.

CANON SHOT
Canon's latest BJC-55 portable printer (above) weighs just 0.9Kg and can print up to five pages a minute in mono and two in colour using a USB or fast (4Mbits/sec) infra-red link. Options include a scanner cartridge that can enable faxing on the move.
www.canon.co.uk

CLICK OFF
The BTClick service, which offered Internet access from anywhere at local call rates, has been discontinued and users were advised to switch to BTInternet. This would leave them better off financially: basic charges are 1p a minute off-peak, 2p at other times; also on offer are BT's unmetered Surftime deals. However, BTClick users had to re-register BTInternet service and install new dialler software before the cut-off date.

FLIPPING NICE!
Coloured scribbles on traditional paper flipcharts can be transformed instantly into computer images thanks to a new product from Virtual Ink.
It's a version of the Mimio transcriber originally designed for digitised writing and drawings on a standard whiteboard. The new £199 mimioFlipChart supports up to eight colours and uses either a USB or standard serial port. Virtual Ink 0870 458 3344
www.mimio.com

THIS COULD BE EU
Europe could drop .com in favour of .eu as its flagship domain extension as soon as next year, after getting the nod from the governing Internet Corporation for Assigned Names and Numbers (Icann).

BT 'dragging feet' on ADSL...

BT and watchdog Oftel have been under fire from all sides for allegedly delaying the rollout of fast ADSL services.

Oftel, which should ensure BT gives rivals a level playing field, was reported in the *Financial Times* as having lost the confidence of officials of both the UK Government and the European Commission.

Olli Rehn, head of cabinet for EU information commissioner Erkki Liikanen, claimed the UK had dropped from the premier league of telecoms liberalisation to the 'relegation zone'.

David Edmunds, director general of Oftel, has admitted that he should have been tougher with BT. And two in three senior communications professionals in Britain believe Oftel has failed to deliver competition, according to a report from the Communications Management Association.

BT is supposed to be 'opening up the local loop' – allowing competitors to install equipment in its local exchanges to offer a variety of high-speed services to the home. This would offer the kind of open market in services and equipment that has driven dialup modem speeds up and prices down. The first phase, involving 361 exchanges, is due to start by the end of the year.

One BT insider has been quoted as describing its response as 'going backwards slowly'. BT is accused of cherry-picking exchanges to install ADSL, allowing rivals into only unprofitable areas, and exaggerating problems of space and compatibility.

RSL Communications withdrew its application, crying foul. WorldCom and Global Crossing have also withdrawn. And World Online chief executive Simon Preston said competition would be delayed by at least two years if Oftel fails to get BT to move. Even Microsoft got in on the act. UK managing director Neil Holloway accused BT of obstruction: 'It's not in BT's interests to get everyone else to roll [ADSL] out.'

He called for a merger of the UK's big two cable operators, Telewest and NTL, to speed up broadband competition.

...and over toll-free service, says AOL

Simmering resentment over BT's unmetered record erupted at the Labour Party conference in Brighton when AOL's head of communications Matt Peacock spoke at a fringe meeting headlined by eminister Patricia Hewitt.

Days earlier, at the Live 2000 show in London, Peacock had regaled journalists with tales of AOL's epic 18-month struggle to get BT to sell service providers unmetered service wholesale. He blamed the failure of some toll-free services on the fact that they began before BT agreed the so-called Friaco (flat-rate Internet access origination) scheme.

AOL has offered long-standing subscribers a Friaco-based £14.99-a-month unmetered deal which it will roll out to others 'within a few weeks'.

Peacock said that when AOL representatives first approached BT about the idea they were virtually thrown out of the office. At Brighton, when he repeated the story, he was sitting behind BT's head of corporate affairs, Sandy Walkington, who said AOL could stand for 'Any Old Lies'.

Walkington added: 'The simple fact is that the BT network did not have the capacity to carry the unmetered traffic.' He claimed that BT had since made a huge investment in its backbone.

Toll-free services continue to have problems and World Online angered its users by increasing its charges by almost £10 a month.
ADDITIONAL REPORTING VNUNET

KZUK.net caters for the kids

AOL may consider itself a family-friendly service, but there is still a case for kids have their own portals, according to the founders of KZUK.net. The site at www.kzuk.net *claims to provide a safe environment for children, and has art, chat, fun and email zones populated by colourful characters. Parents have full control over access but the service is not at all prissy... one popular game is a target gallery in which a shooter picks his nose to get ammunition. The site also offers help with homework. More help for 5 to 11-year-olds is at* www.schoolfiend.co.uk*.*

Spending a web penny

Web companies are taking a leaf out of the book of mobile-phone operators to overcome a major obstacle to ecommerce – how to 'spend a penny' (in the literal sense) electronically.

Credit cards, security fears aside, are fine for paying larger sums online. But a vast layer of economic activity is debarred because a way of spending small sums has yet to be generally accepted.

Many believe the threat to the music industry raised by 'file sharing' systems such as Napster would be far less if it were easy for people to buy single tracks legitimately.

Mobile services have an advantage in this respect because the phone link has a built-in billing service. At the recent Live 2000 show in London, Virgin unveiled a vending machine operated by a mobile phone: you simply call it up to buy anything from tickets to a bottle of Coke and the charge goes on your account.

There are micropayment schemes for fixed web links but none has approached the global reach of plastic.

Now two companies have introduced schemes based on pre-pay cards of the type used for mobile phones. World Online launched, again at Live 2000, what it calls Jalda cards that were jointly developed by Hewlett-Packard and Ericsson. These come in values of £5, £10 and £20 and allow you to spend as little as 10p.

A similar scheme, called Interactivcash cards, has been set up by Gobal Internet Billing, for the shopping and information portal British Information. The cards are available in values of between £10 and £100.

Porn spotter counts flesh

Developers claim their email screening module can detect pornography by scanning image files. Pornsweeper is designed for companies that fear they may be liable for material sent by staff via email that contravenes obscenity or harassment laws.

The software uses a statistical analysis of the incidence of flesh colours in an image file. It comes as an add-on to Content Technologies' Mailsweeper suite.

● Two men have been arrested in Japan for developing websites with pornographic content for mobile iMode phones.
www.contenttechnologies.com

Projectors see the Digital Light

New Digital Light Processing (DLP) techniques have produced an array of powerful projectors that are about the same size and weight as a notebook.

The Sharp PG-M10 range, such as the one pictured right, uses a Texas Instruments Digital Micro-mirror Device, a chip with an array of 1,310,000 mirrors

that twist to create a high-resolution, colour image. Models with SXGA (1,280 x 1,024) or XGA (1,024 x 768) resolution are available.

Toshiba has also launched a similar class of machine called the TLP-B2, and Riyad Emeran reviews an ASK model on page 101. As he observes, they don't come cheap but they are very desirable. And a couple of years ago, projectors of this kind were three times the size and cost £7,000-plus.

Microsoft man quits

Millionaire Ran Mokady, head of Cambridge mobile developer STNC, has quit only months after the company was bought by Microsoft.

STNC did a lot of work for Psion and Microsoft was believed to have bought the company to get an inside track into the Psion-led Symbian platform.

Mokady has launched a new venture called Commtag to develop products and services for mobile users.

In an oblique comment on Microsoft's slant on mobile services Mokady said: 'People do not want to use their phone to check stock quotes – that can wait until they get home. Our products will improve interpersonal communication and make the exchange of data between people as easy as making a phone call.'

See also Simon Rockman's analysis of the pocket wars on page 42.

Telecoms firms throw doubts on 3G

Telecoms chiefs are beginning to have second thoughts about 3G (third-generation) mobile systems. Five companies have bid £22b to set up a 3G network in the UK and some £48b more has been put up in Germany, France and the Netherlands – all simply for the right to build.

Jorg Kramer, vice-chairman of the GSM Association and group director of Vodafone Mannesmann's mobile division, feared operators had neither the time nor the money to realise the full potential.

Early trials have shown that 3G UMTS networks will

transport data at only 64Kbits/sec rather than the 384Kbits touted and far less than the 2Mbits theoretical maximum, he said at a convention in Marrakesh held to thrash out how operators can recoup their investment.

Kramer said: 'Our tests show that 384Kbits/sec is possible. But only if you are the only person using the cell, standing next to a trans-mitter, and not moving.'

Dirk Hemmerden, director of product development with T-Motion, the mobile arm of Deutsche Telekom, admitted: 'We will need to double income per capita simply to pay for the licence and the construction'.

He reckoned this represented income of more than $2,000 (£1,250) per year per subscriber.

A fuller version of this story by Sally Whittle is on vnunet.com.

Microsoft launches .NET with little of its old cockiness, says Clive Akass

Web 'vision' unveiled

Microsoft staged an uncharacteristically low-key launch of the first nine products of what it is pleased to call its '.NET vision', though enterprise-marketing director Oliver Roll described the event, correctly, as one of the most important in the company's history.

The Enterprise 2000 products (see below) are all back-end servers of the type taken for granted by users; but they are vital to Microsoft's future and will spark titanic struggles among the web's infrastructure providers.

Leading the pack was the Win2K Datacenter Server, which was actually being deployed before the launch. This is Microsoft's answer to the big Unix systems that still dominate the web. It supports up to 32 processors and 64GB of memory and Microsoft claims it is both faster and cheaper than rival Sun's systems.

The launch came amid fresh moves in Microsoft's appeal against the Department of Justice's anti-trust ruling – a continuing saga that is only one of the reasons the company is chastened. It was beginning to drift long before the DoJ

The Microsoft campus, it seems, needed the 'vision' thing

case began – the momentum of DOS, Windows and the Office applications had carried it through its first two heady decades and it was wondering where to go next.

Microsoft could not keep reinventing Office and the operating system; and the web, which is inherently open systems, was steadily eroding the basis of its near-monopoly. Microsoft's response to the web could never be more than a holding operation: its MSN service, though flourishing, has never fully pulled back from early disasters; and Internet Explorer was a tactical rather than a strategic success. As one Microsoft insider told *PCW*: 'So we had a good browser. What next?'

He pointed out that the company has thousands of development staff, and it is a huge task to keep them all

usefully focused.

This goes some way towards explaining why .NET has perplexed outsiders. The 'vision' seems simply to state what everyone knew already: that the web, with the help of data-savvy XML, is evolving increasingly sophisticated ways to store, find and use information.

The outside world did not need the 'vision', but Microsoft did. .NET is Microsoft's strategy for developing products to meet the demands of what is already happening. It provides a map for all those Microsoft software engineers, telling them where to head.

Microsoft is not the company it was. Group marketing manager Jeremy Gittings, said: 'We know we can't do it all. The web is too big for us. We have lost a lot of our arrogance.'

Microsoft props up ailing rival

Troubled Corel got a surprise $135m (£84m) injection from arch-rival Microsoft just a couple of days after unveiling version 10 of Corel Draw, the product that made its name.

The deal gives Microsoft 24 million non-voting shares in Corel, equivalent to a 24.6 per cent stake if converted into common shares.

The deal is replete with ironies. Corel tried to challenge Microsoft on the desktop by purchasing WordPerfect from Novell in 1995. And WordPerfect was by far the most-used word processor until it was side-lined by Microsoft's Word after the advent of Windows.

WordPerfect was slow to adjust to the new interface, and Word was very good very early. But Microsoft had the advantage of an inside knowledge of the operating system and was frequently accused of using it unfairly.

The Corel deal is not just a case of throwing a lifeline to an early victim.

Corel also tried to outflank Microsoft by investing heavily in Linux and there has been speculation that it is this link the Redmond giant wishes to exploit.

Corel Draw 10 boasts improved colour manage-ment, smoother screen refresh, and a streamlined interface. A new module called RAVE supports vector-animation and exports in the Macro-media Flash swf format.
● See *PCW* January for a full review.

Setting out Enterprise 2000's stall

The one surprise among the Enterprise 2000 server software launches was a module to cope with the needs of mobile devices.

The Mobile Information 2001 server will be available next year – as its name implies – and will ship with Outlook Mobile Access, with which mobile devices can access organiser information.

Another module, Mobile

Manager, will extend Outlook's synchronisation functions for use with mobile devices without need for the server.

Available immediately are the SQL Server 2000 relational database system, and the Exchange 2000 messaging server.

Rolling out over the coming year are the following:
● BizTalk Server 2000, for

'integrating and automating' business processes
● Applications Center Server 2000 for the management of web-based applications
● Commerce Server 2000 for building ecommerce applications
● Internet Security and Acceleration Server 2000 for fast, secure web links
● Host Integration Server 2000 that enables integration with non-Microsoft systems.

Net fraudsters go unpunished

Nine out of 10 Internet frauds in the UK still go unpunished, claims a report by UK credit agency Experian.

The report accuses net vendors of encouraging fraud by not reporting it and failing to cross-check credit card addresses with delivery addresses. Police are also blamed for not following up complaints.

Fewer than six in 10 of the 800 ebusinesses questioned in the survey bothered to report fraudulent transactions, and more than half of those that did said the police failed to follow up complaints.

Experian spokesman Richard Fiddis said: 'The Internet is becoming the first choice for thieves who, in another age, might have just been petty shoplifters or locker room pickpockets.'

He said buyers are not at financial risk, because card companies are liable. But the damage to ebusinesses is significant, accounting for the equivalent of around 10 per cent of sales at affected sites.

JAMES MIDDLETON
VNUNET.COM

Low-cost sensor beats film

A California start-up led by a well-known semiconductor pioneer has launched a potentially low-cost image sensor with a resolution higher than standard 35mm film.

The 16.8megapixel sensor from Foveon uses cheaper CMOS technology, previously used only on low-quality sensors, but it is said to have advantages over the more common charge-coupled device (CCD).

Kodak announced a 16.8megapixel CCD only a few days before the Foveon launch. Both chips will be used, initially at least, in expensive professional cameras.

Image sensors currently account for a high proportion of the cost of a digital camera, but the more pixels

Foveon chief scientist Richard Merrill next to an 8ft print of a picture taken with the 16.8megapixel sensor

there are the greater the need for costly processing power and memory.

Foveon founder professor Carver Mead, of the California Institute of Technology, worked on silicon integration in the 1960s and invented the Gallium Arsenide transistor. His work on natural processing of signals from the eye and the ear in the 1980s

led to the development of an artificial retina – Foveon is named after the retina's centre of vision.

The company is 40 per cent owned by chip giant National Semiconductor, which will make the sensor using 0.18micron technology.

Foveon has applied for around 40 patents on its chip. Mead is reticent about how it works but says it 'senses colour at every point'.

Image sensors normally have pixels of three cells, each sensitive to a different primary colour, so the colour is averaged across the pixel; this leads to aberrations such as whirling 'moiré patterns' and a twinkling of different colours where there should a clear edge.

Foveon appears to use a separate array, illuminated by a beam splitter, for each primary colour; initial signal processing is done by analog elements in the chip.

Taiwan virus man faces jail

The past has caught up with Chen Ing-Hau, the Taiwanese man who is said to have written the Chernobyl virus, one of the most destructive ever. Triggered each year on 26 April, the anniversary of the Chernobyl nuclear disaster, it was the first capable of crippling a PC for good.

Chen Ing-Hau was named more than a year ago but was not charged. A Taiwanese resident filed a complaint after the virus struck again in April and the police reopened the files. Chen Ing-Hau faces up to three years in jail.

VNUNET.COM

Intel drops the Timna as Geodes is unveiled

Intel has dropped its highly-integrated Timna processor, designed for sub-£400 PCs, because of 'design problems and market conditions'.

The news came as National Semiconductor, which has focused on low-cost x86 system-on-a-chip designs, announced three new all-in-one processors.

But Intel would have had a hard time competing on 'bangs per buck' with AMD's Durons, and even its own Celerons, by the time it could have launched the Timna.

The Timna was to have been Intel's first processor to pack a graphics engine and memory controller. It was expected to ship in the first quarter of next year.

Intel said there were problems with Timna's Memory Translation Hub (MTH), which would allow it to use SDRAM memory rather than the more expensive RDRAM.

The company evidently didn't want a repeat of the embarrassment earlier this year, when MTH problems forced it to withdraw motherboards using its 820 chipset.

The three new NatSemi Geode chips, the SC1200, SC2200 and SC3200, are optimised respectively for use in set-top boxes, thin clients, and portable Webpads. They allow vendors to make appliances with a minimum of support components: the target price for Webpads, for instance, is less than £200.

Colin Clifford, NatSemi's business development manager for Europe, said the three chips offered the best combination of price, performance and power consumption. 'They should have a big impact on system costs,' he added.

BROADBAND

Niall Magennis on how BT stops service providers from being able to guarantee ADSL bandwidths

Quality of service is not strained

UK Internet users could suffer from tardy ADSL line speeds because service providers are unable to guarantee minimum bandwidth levels on broadband links, experts have warned.

In the US, some users are already going as far as slapping lawsuits on their ISPs because links are not living up to the speed levels promised in adverts. A lawsuit, filed by a computer technical support company in Texas, along with several of its customers, claims that US telecoms giant SBC Communications is limiting advertised downstream speeds of at least 384Kbits/sec to an actual rate of 128Kbits/sec.

The users are arguing that SBC had to limit the access speeds to certain parts of its service because it was flooded with new users after an aggressive advertising drive.

UK Internet users, already incensed by automatic logouts on free ISPs, could suffer similar problems to those experienced in the US if they decide to switch to ADSL. This is because ISPs offering ADSL, including BT's own OpenWorld brand, only quote the maximum achievable speed, instead of stating a minimum acceptable bandwidth rate.

'In the UK, I'm not aware of anyone who gives guaranteed availability in the consumer sector. A situation like this would not leave UK users in a very happy position, and people would not really be able to sue,' said Dai Davis, consultant with legal firm Nabarro Nathanson.

'It would be very much harder to bring a claim in the UK for two reasons. First, because the advertisements are usually quite carefully worded, in that they only guarantee the capability rather than the availability of the service.

'Second, even if they did advertise availability – and therefore there was potential liability – it's not something Trading Standards would want to get involved in because it would be difficult to prove it. And as far as the individual is concerned it's never going to be worth their while in terms of economics to sue.'

However, Nicholas Lansman, secretary general of ISP trade association ISPA, argued that the US case was not a good indicator of what could happen in the UK.

'I think the US lawsuit is really a simple case of trading standards,' he said, 'in the same way as we've seen some ISPs offering a service at a price that is anything from free to very cheap and not actually delivering on that. It sounds like they're promising things that they can't commit to, which is not right, and no doubt Trading Standards, whether it's in the US or Europe, will have a go at them.'

The core of the problem lies in the fact that ISPs have to purchase ADSL lines on a wholesale basis from BT, which is refusing to give them any kind of service-level guarantees.

'The infrastructure is basically BT's, so all issues on ADSL originate from BT,' said Andy Taylor, product manager for ADSL services at UK ISP Direct Connection.

'There is no service-level agreement between BT and ISPs. Which is probably why you'll find there are no service-level agreements being offered on ADSL lines by ISPs themselves. Since we get no service-level agreement from BT, we can't offer our customers one because we couldn't guarantee it ourselves. We would then be leaving ourselves exposed,' said Taylor. 'The traffic is going over BT's network so there is nothing we could do.'

BT sells ISPs ADSL links with contention ratios of 50:1 for the consumer service and 20:1 for the business service, but Taylor said ISPs can, if they wish, increase the ratios either to make the service cheaper or to increase their subscriber base.

'The ISP can contend the service further at their end so they can make it go slower to try and get more customers down the link or they can leave it to BT. We're going to keep it at the BT level. So when you hear of contention ratios of 20:1 or 50:1 that's basically the contention ratio across the BT line supplied to the ISP.'

Taylor argued that ISPs would probably jump at the chance to offer service-level agreements on ADSL, if they were given the ability to do so. 'It would be great if BT was offering some kind of service-level agreement. It would be fabulous for the consumer, as it would be lovely to get IP traffic up to telco standards,' he said.

Dock in the St@rBay for a gatway to the Internet

Broadband to the home involves more than buying an ADSL, satellite or cable link. You then have to do something with it. St@rBay modules, from an SCM/Microsoft joint venture, integrate the PC, broadband and TV links into a home entertainment system.

They are doubly interesting because they use the promising but apparently defunct architecture that envisages PCs taking peripherals in the form of standard modules stacked into bays linked by a backbone of USB and 1394 (FireWire) buses.

The pictured module shows a cable input, with a conditional access slot that takes decryption cards. The system can also cope with terrestrial and satellite TV, DVD and streaming video as well as Internet-enabling your TV. It can record one program while watching another, and supports picture-in-picture so you can watch both at the same time. The units use the TV features of Windows 2000.

DEVICES

Clive Akass begins a five-page report on appliance technology with a preview of future devices

Ringing in the changes

A crumb of consolation for anyone who has been driven crazy trying to negotiate the tortuous menus of a voice response system (which means just about anyone who uses the phone) is that the technology will soon retire to applications for which it is truly appropriate. When smart phones become the norm, you should be able to take in all your options in a second on a single screen.

Voice menus are to smart phones what WAP is to current mobile devices: an intermediate technology doing poorly, what should soon be done a whole lot better. Vendors are beginning to lift the veil on devices that will supersede the current, inadequate, generation of WAP phones.

Bluetooth, the short-range wireless link that will hit the market late this year, allows a handheld to contain the guts of a phone and communicate wirelessly with a hands-free headset, designs of which seem certain to proliferate as fashion accessories.

Bluetooth could thus do away with mobile phones as we know and love them, but opinion is divided over this.

Manufacturers foresee a number of form factors emerging. Rainer Lischetzki, technical marketing manager of Motorola's personal networks group, believes people will have two or three devices, maybe carrying a palmtop during the day and a small mobile in the evening.

Oddly, considering the irritations of using WAP on small phones, Motorola appears to favour tiny designs, even for its mini-organisers. Its Accompli email client is little bigger than a matchbox. They will be available in the UK shortly and a GPRS (see page 49) version will follow.

This November, BT Cellnet will launch a GPRS version of the slightly larger Blackberry emailer that, like the Accompli, has been a big hit in the US. A future model will include a GPRS phone.

A similar approach is taken by so-called 'communicators' such as the Nokia and Ericsson models (pages 88-89, picture page 42) which effectively stick an organiser into a mobile phone.

Opinion at *PCW* Towers is split on whether this phone-type design will survive. My bet would be on the reverse approach of putting the phone functionality into an organiser, which is surely more practical for heavy-duty use. This is what Palm will do next year with a model designed in conjunction with Motorola, using some technology from Symbian.

Mitsubishi will ship a similar design, the Trium Mondo, in November using Microsoft's Pocket PC OS. It will cost around £400.

These designs will also allow the use of hands-free kits, connected by wire, or Bluetooth. The Mondo will also include an MP3 player.

Ergonomics is not the only issue here, however. Peter Mann, European head of Casio's mobile business development unit, points out that organisers with cellphones will be heavy on battery life due to the colour screens and phone unit.

Casio keeps the organiser and phone separate on its MessageCam, developed as a 5,000-unit limited edition with Vodafone. Its tiny webcam sends 'picture mail' and will sell in November for £349.99, including the Seimens GSM phone.

Mitsubishi's Trium Mondo will sell in November for around £400. It packs dual-band GSM, WAP, and Pocket Explorer, as well as the usual organiser apps

The MessageCam, which will be sold exclusively for the Vodafone network, has very basic organiser functions and is intended mainly for sending 'picture mail'. It has 2MB of RAM, but that can hold a surprising number of quarter-VGA pictures and at around 20KB each can be transmitted in under 30 seconds on a 9,600 GSM link

Above: Motorola's Accompli has been highly successful in the US despite its small size. Its thumb-driven Qwerty keyboard, like that of Motorola's 'concept design' (bottom) is tiny but it's a whole lot better than a phone keypad

DEVICES

Symbian, once touted as the Microsoft of mobiles, is not as shaky as it seems, says Simon Rockman

Pocket wars of the mobile giants

The war for the Internet in your pocket looks at first sight to be going badly for Symbian, the alliance Psion formed with mobile phone makers Motorola, Ericsson and Nokia. These three are all now sleeping with the enemy. Motorola has announced that it is working with Palm, Nokia has licensed the Palm operating system, and Ericsson is to collaborate with Microsoft. Sony and Panasonic, Symbian licensees both, already make Windows devices and Sony has even put Mobile Explorer in its two newest phones.

The picture is brighter for Symbian if you look deeper. It's all about using the right software for the task in hand: the standard tools for developing Symbian applications, for instance, are Microsoft programs.

Microsoft has given up trying to dominate the handheld market and is happy for its mobile applications to run on any handset operating system.

This means the company won't shift the goalposts to stall attempts of rival products to talk to Microsoft infrastructure like Exchange.

Ericsson is working with Microsoft-owned STNC in Cambridge on what (reading between the lines of the press release) will be a version of Microsoft Mobile Explorer to be run on what used to be called EPOC, and is now called the Symbian Operating System.

Normally I'd say that getting Microsoft to write apps for a non-Wintel platform would lead to flabby software but the STNC people, who have long experience of developing web software for Psion, know what they are doing.

Neither does Nokia's deal with Palm mean it is turning its back on Symbian. The deal is merely an attempt to superimpose the Palm look and feel on to the Symbian OS.

This would give Nokia the best of both worlds: a Symbian-based device that can be sold to the largest handheld user base.

Motorola has announced a product based on Symbian's Pearl design for

Ericsson's R380 — late, but Symbian-based. See review on page 88

phone handsets, and Ericsson has demonstrated a Symbian Palm-style Quartz design. Ericsson had also shipped its Symbian-based R380 (pictured above) – albeit a year later. And Real Networks and Nokia are porting Real Player to the operating system

The fact that Symbian has a superior operating system is less important than its alliances. It's impossible to overplay the significance of Nokia, Ericsson and Motorola in the mobile phone world. Depending on how you draw the regional

and the technological lines, each is dominant in some territories. In the UK, Nokia sells something like four in 10 handsets. In the world market Motorola is the biggest player, and in some niche markets (such as Greece) Ericsson is strong. Together they have 80 per cent of the mobile phone handset market.

They won't maintain this, of course, because growth in the market is so rapid it's impossible for them to keep up. Not only are more people buying mobile phones, those with them are keeping them for shorter periods.

I heard one figure which said that Nokia would have to open a new factory every fortnight to maintain market share. But Nokia, Ericsson and Motorola will remain dominant. What matters is their loyalty to Symbian.

Which is why, where you may see devices using Palm or Microsoft products, they will probably have Symbian software underlying them.

With the backing of the industry's major players, Symbian will set the industry standard, provided it gets its products right and out of the door on time.

Who'll do what with Symbian?

This is how I see the various device makers using Symbian:
PSION
Solid Symbian, though will synchronise with Microsoft products and will ensure relevant support is included in future releases of Windows.
SONY
Too early to tell. Sony has both Palm and Symbian licences which is one in the eye for Microsoft. Sony is also the first company to ship a phone with Microsoft Mobile Explorer (and jolly good it is too). Don't, however, expect a CE 3.0 smartphone from Sony.

NOKIA
Exercises enormous control over its products which is why it wanted control over the OS. Produces the best handsets. Expect its Symbian products to be heavily influenced by Nokia design. No use of Microsoft operating system but interested in running Palm apps under Symbian.
ERICSSON
Wears a coat of many colours. First to release Symbian products but happy to use whatever OS, including Windows CE, that serves its purpose – its Screenphone is Linux-based.

MOTOROLA
A wild card. Collects operating system licences (NeXT-step, OS/2 and Newton) that it does precious little with. Will produce Microsoft-based devices but a Symbian phone is guaranteed even if the company does have a history of smartphones that don't appear. But it does have a big Symbian team. Motorola politics mean luck is as important as having a good product when getting it shipped. I hope the Starfish team do get lucky as its MMI is what the phones badly, badly need.

DEVICES

Cambridge-based ARM's new chip design could really give its competitors the JITters

Java gets into hard core

Cambridge-based ARM has hardwired a Java Virtual Machine (JVM) into its architecture in a move that should consolidate its claim to be the world's leading designer of processors for smart appliances.

The company, originally a spin-off from UK computing pioneer Acorn, got a further boost in September with Intel's launch of the StrongARM-based XScale architecture (see *PCW*, November 2000).

ARM does not make any actual chips: its core designs are licensed to manufacturers that add peripheral silicon to tailor them to specific tasks or markets. This is what Digital did to create the StrongARM processor, which Intel bought and tweaked into XScale – the first non-x86 design the company has pushed into a mainstream market.

In fact, the ARM architecture already rivals Intel's x86 as the world's leading design in terms of unit sales. ARM's processor product licensing manager, David Cormie, reckons that about as many ARM cores were sold last year as all PC chips put together – including those from Intel's rivals.

This could just be the start. Most of these sales stem from the mobile phone boom, while the market for other ARM-powered devices like handhelds and set-top boxes is still in its infancy. The new JVM extension will turbocharge the running of Java applets downloaded to such devices.

Java is attractive to device makers because it is hardware neutral: the same code can run on a PC, a Mac, a Linux box or any other machine that packs a JVM.

Moreover, Java's compact bytecode is an efficient way to package applets for transfer over the web.

Java's biggest drawback is speed: traditional applications are pre-compiled for the host processor, but Java bytecode has to be translated into the native code of the host machine. This is not a big problem on desktop PCs, most of which are fast enough to run Java code (generally within a browser) at an acceptable speed – particularly with the use of Just-in-Time (JIT) compilers, which translate entire applets before they are run.

JIT-compiled applets run at half the speed of native apps, or even slower, but this is usually of no account when most PC processors run far faster than is required for most tasks. Applets need only to run fast enough.

However, JITs boost code size by up to eight times and require a comparatively large 100KB of active memory. This renders them impractical on highly-integrated mobile devices that typically have a working memory of tens of kilobytes on the same chip as the logic and taking up some 80 per cent of the space.

JITs are also poor at realtime applications that need the speed of native code. As a result there has been much interest in alternatives. Java developer Sun led the way with its picoJava core, which ran Java bytecode natively. But it was

Cormie: There will be some overlap in the market

disappointingly slow and was not good at the kind of time-critical, low-level task like hardware control, for which Java, a high-level language, was not designed.

Two new dedicated Java processors take different approaches to this problem: the Cjip, from Sweden-based Imsys, uses its own realtime operating system; while the aJ-100, from California's Ajile Systems, includes a realtime kernel.

A third approach is taken by Jedi Technologies, of Silicon Valley, with its JStar co-processor that can be coupled to virtually any 32bit or 64bit main processor. JStar intercepts Java bytecode and passes it as native code to the CPU; native instructions are processed as normal.

ARM's new J-XXX extension is different again. Java bytecode in effect becomes part of the instruction set of the chip, which can switch between native and Java on the fly; or

Sun Java chip... ARM claims its own core is faster

rather about 80 per cent of the bytecode goes native: some 20 per cent is translated into standard ARM code.

'This was to keep the size down,' explained Cormie. 'It was more efficient to translate some of the more complete Java instructions.'

The result, according to ARM, is a chip that is faster than any dedicated Java processor and only marginally slower than a JIT compiler but requires just 8KB of memory. Specifically, using the CaffeineMark 3.0 benchmark, the ARM 9 implementation scores 5.4 compared with 2.87 for the JStar coupled to a MIPS R3000 core, and 2.9 for the AJ-100.

In addition, it has good realtime support and can take advantage of the considerable ARM legacy of software development kits and support for major operating systems like PocketPC, Windows CE, EPOC 32 and Linux.

J-XXX is available initially for ARM 9 cores, which also include enhanced signal processing and are used in set-top boxes, networking, hard drives, DVD controllers, mobile telephones and embedded control units.

The extension will be rolled out next year for the ARM 7 family, much used in handhelds, and the high-performance ARM 10 line.

Cormie does not see the new design as a rival to XScale, which is after all just one ARM implementation among many – all of which quietly pump royalties to his company. 'There will be some overlap in the market,' he said. 'And, of course, Intel is free to license the new Java extension.'

CLIVE AKASS

DEVICES

After all the hype, developers are desperately seeking ways to make WAP more usable

Whither WAP and whence?

The unexpected success of mobile SMS messages, now said to outnumber voice calls, has almost certainly distorted the development of interactive services.

There was a rush to develop WAP as investors noted that people were ready, even eager, to jab out text messages on a ludicrously inadequate keyboard and read the results on a tiny, barely decipherable screen.

Yet relatively few people are using WAP, even though operators are almost giving phones away. So what went wrong? Most SMS messages are sent by young people with nimble fingers, good eyes, an ability to make sense of garbled text, and a willingness to sacrifice all comfort and grace in the name of fashion.

WAP services, on the other hand, have largely been targeted at people with neither the time, nor the patience to cope with anything that does not come good and easy.

SMS offered something new: a way to get a text message quickly to anyone,

Kell: Caching speeds up WAP responses

anywhere. Information offered on most WAP services can be obtained elsewhere, usually more easily and invariably more comprehensively. User disappointment was almost guaranteed by adverts giving the impression that people could happily surf the net by WAP phones. And WAP operators made matters worse by locking users, already irritated by slow and pricey response times, out of rival sites.

Many developers still blame WAP's slow take-up on a lack of

applications – but then developers are in the business of selling applications, or the tools to make them. They are also desperately seeking ways to make WAP more usable.

GPRS (see opposite) will improve response times, particularly by cutting out the dial-up process.

John Kell, research director of mobile specialist Peramon, says caching supported by the latest phones can also help because users can make choices from stored front-end menus, which can include web addresses.

Emerging DAB digital radio services may eventually have a part to play here by broadcasting cachable data (see pages 25 and 96). Some operators are looking at the Japanese company DoCoMo's rival i-mode system on the grounds that 11 million users can't be wrong. I-mode is based on a compact form of HTML called cHTML, developed largely by DoCoMo.

To run i-mode, existing WAP

operators will either need to translate WAP's Wireless Markup Language (WML) into cHTML or invest in dedicated i-mode services.

WAP is improving. Trivanti, a joint venture between Psion and United News Media, has done some impressive work speeding up responses and designing for larger screen formats like those of Ericsson's R380 and the Nokia Communicator.

But both i-mode and WAP are designed to mitigate, if not overcome, the limitations of today's devices.

As the DAB initiative (with which Trivanti is linked through Psion) shows they are not the ultimate in handheld data links. They will evolve or die as new devices and faster links emerge, but mobile interactivity is here to stay.

● Peramon has just launched a suite of mobile Internet tools called Mobiliser*, which support a choice of standards including WML, HTML and VoiceHTML. Evaluation copies can be downloaded from www.peramon.com.

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DEVICES
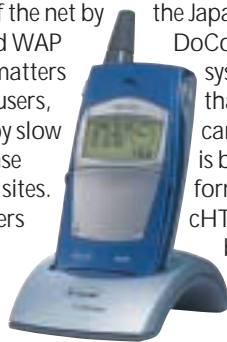
BT Cellnet has promised rollout of its next-generation GPRS mobile data services any day now

Hanging on the line for GPRS

Next generation GPRS mobile data services, currently on limited trial by corporate customers, will be available to everyone countrywide by the end of the year, BT Cellnet has pledged.

Users will have to pay a monthly subscription of around £15 plus about £1.50 per megabyte above 50MB transferred each month, GPRS programme manager Peter Lisle revealed at the Live 2000 show in London. Vodafone also plans to roll out services at much the same time.

GPRS vendors are still hyping a 171.2Kbits/sec 'theoretical maximum' transfer rate for the technology, which is verging on an outright lie. A 200MHz GPRS channel can carry this amount if all its eight time slots are used in perfect conditions – but current phones can use only one slot for the uplink and two for the down; one-up/four-down phones are expected shortly.

The uplink speed is limited by both battery life and health fears: the more time slots used, the greater the power drain and the greater the screening needed to satisfy safety regulations. Motorola says it will have a two/four-slot phone soon.

Which brings us, currently, to a 'theoretical maximum' of around 20/40Kbits/sec – and even this is around double what you can expect in practice. You have to take into account error correction, for which GPRS provides four levels: from rigorous Class 1, for sensitive tasks such as transactions, to Class 4 which is none at all. Cellnet is implementing only the top two classes, which respectively leave you with transfer rates of 7Kbits/sec and 10Kbits/sec per time slot.

So with full error correction the best download speed you can hope for is that of an eight-year-old 14.4Kbits/sec modem. You might get 28Kbits/sec shortly, but you will still be stuck with 7Kbits/sec upstream.

The good news is that this is all rather better than it sounds: as with first-generation fixed broadband services like ADSL and cable, the fact that GPRS is always on will be almost as important as the data rate. The perceived speed will be much greater than with straight GSM because the dial-up process is eliminated.

A bonus is that a GPRS download, charged per megabyte, can work out cheaper than one over a straight GSM link when you are charged for the time taken to reach the information, plus download time, says Rainer Lischetski, technical marketing manager of Motorola's personal networks group.

He says all Motorola models will be GPRS-ready by the end of the year, and he warns that the technology will survive way beyond the introduction of 3G UMTS services designed to supersede it. GPRS is basically superimposing a packet-switched IP network onto an existing circuit-switched infrastructure, just as the Internet did with the old steam telephone line. UMTS involved the creation of a completely new infrastructure and its implementation will take time. Lischetski warned: 'You are going to get islands of 3G only in high use areas at first. You are going to need phones that are capable of UMTS, GPRS and even GSM voice for some years yet.'

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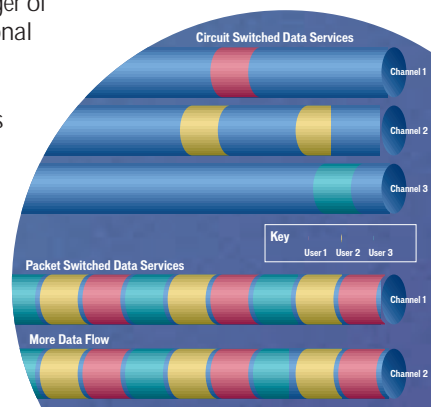
Making a packet… this Vodafone diagram shows how packet-switching uses channels much more efficiently than circuit-switched networks which allot one channel per user

NEXT GENERATION

A new Apple operating system and Sony's handheld Clié are significant launches, says Tim Bajarin

Taking technology up to new levels

Apple led the entire industry into the age of graphical user interfaces, though it 'lifted' the idea from Xerox Parc and, of course, Microsoft took it to the masses with Windows.

Both Apple and Microsoft have added many features to the GUI over the years.

But Apple's new OS X operating system for Macs, introduces with its Aqua technology what I believe is clearly the next revolution in interface design.

Today, when you want to create a file, you give it a text name which is then represented by some icon defined by the application. Aqua takes file management to a much higher level by allowing the user to view the actual file to identify it.

This is not a big deal for a text file, as it is if the file is a picture, image, animation or video clip. That means that if I take a picture of my son, I can now give it a textual identity and at the same time I can actually see the picture of my son in the file's thumbnail - and zoom it out at least 10 times if need be. The same goes for a document or spreadsheet.

For the first time, this provides a visual file management system within a graphical interface.

Just as cool is the fact that these thumbnails can be stored on your navigational bar giving you visual access at all times.

There are many other important new features in OS X that will impact the next genera-tion of personal computing and the Mac appears to be leading the way again.

Every picture tells a story ... the icons in Apple's new Mac OS X are zoomable miniatures of a file's contents

Sony's entry into in the organiser parade is also significant. Around eight million handheld devices have been sold worldwide, with Palm taking the lead with its Pilots.

Most of these products have found their way into the hands of business users. But Sony, one of the world's largest consumer electronics makers, is taking aim directly at the consumer market. Sony hopes its Clié will be the next 'Walkman' in personal electronics. The name stands for Communica-tion, Link, Information and Entertainment – and Sony sees this as a powerful new platform for handheld devices.

It uses the Palm Pilot OS, and it is markedly different in its design and positioning from the basic Palm devices on the market today. Sony has included with its Clié, a memory stick slot, that is designed to provide unlimited memory. This is because, over time, Sony believes that

Sony says its Clié handheld will be launched in the UK in the second quarter of next year

its handheld device will be used for high-quality music, games and movie clips, thus transforming a single PDA into a handheld multimedia-computing system.

Even now it comes with software that lets users download digital pictures so that they can be seen on the Clié and shared with others. But this is just the start. Otherwise, this first version is really a traditional organiser.

But since Sony sees this as a handheld multimedia platform, it's not too difficult to see it creating devices that have a DSP chip embedded for a variety of comms uses, as well as a powerful MP3 and sound chip and a video chip.

Plus, given the landmark work being done by some of the graphics board companies that want to create a 3D chip for these handheld platforms, you could also imagine these devices becoming incredible handheld gaming systems.

While Palm and Handspring would also want to create a similar device, it is Sony that has the market clout to create a product like this for mainstream users.

Sony is clearly creating a rich handheld platform that will give it a significant edge over their competitors and, eventually, make the Clié a very versatile digital assistant.

Both the Mac OS X operating system and the Sony Clié represent serious attempts to take technology to the next level. Apple's OS adds a new dimension to the whole data navigation process, and Sony's Clié could eventually make a handheld device that everybody would want, helping them stay connected – as well as entertained.

If you love your digital camera, recent developments on the net are reassuring, writes Gordon Laing

Smile, you're on digital

It's fair to say that I love digital cameras. As an amateur photographer, PC enthusiast and self-confessed gadget fanatic, they're simply the ultimate combination of my favourite hobbies. The only problem is that the more I use them, the more I think you really do need to be all of the above for them to make any sense. As any digital camera user knows, they're still enough of a novelty to court attention. Curiosity is aroused when you're spotted composing pictures without your eye pressed to a viewfinder, and once people see the colour screen, they're hooked. Immediately viewing a photo then retaking to eliminate blinks and gaping mouths is without a doubt absolutely wonderful, while the ability to plug it into the TV for an impromptu slide show always goes down a treat.

So if digital cameras are clearly so good, why do I spend most of my time actually trying to put non-PC people off them? Well, the fact remains that, for now anyway, digital cameras are not for everyone. I may personally find the digital format convenient for quickly getting photos up on my website or into the PC for a bit of retouching, but the truth is that the vast majority of folk simply want a full set of prints. I may be able to print the occasional A3 enlargement on my colour inkjet, but you still can't beat the price of film and chemical processing for a set of postcard-sized pics.

Living the digital camera dream today really requires your own PC. And your own printer. And a fair degree of technical enthusiasm and expertise – and about 700 quid for the camera of course. If you haven't got any of the above, then it's probably not for you. I also haven't even mentioned the small fact of ensuring you're never more than a couple of days away from mains electricity for recharging, and some kind of mass storage device to free up your precious memory cards. The last two points are probably the most restrictive of all. If you take lots of photos, then most digital cameras will give up the ghost in terms of battery life after about a day. Image storage is a real issue too. Most 3.3megapixel models will squeeze between 30 and 55 best-quality pictures on a 64MB card costing around £150. If you're away for more than a few days, then you'll either need to heavily invest in Flash memory, or carry some kind of notebook around with you.

So with all these downsides, how are digital cameras going to take over the mass photography market? Wait for it... that's right, by harnessing the Internet. Believe it or not, but the next big thing in digital imaging is to upload your pictures onto a third-party website for all to see. Friends and family then browse your photos online, choose which ones they want and order prints directly. Shutterfly in the US has been offering similar services for a while, and now both Sony and Kodak are getting in on the act. It's all about sharing memories – oh, and selling loads of ink, paper and chemicals.

It goes without saying that you'll need a computer and some kind of quick, permanent Internet connection for this to work – or will you? Cunning labs are beginning to offer to scan conventional films during processing, and upload these to websites for the same purpose. Back on the digital camera front, the people who set the standards for where pictures are stored have added automation functions. It's already possible to use your camera to mark favourite photos, after which the card can be inserted into a printer for output, bypassing the PC. Tomorrow, these extensions could instruct a device to fax, email or upload your photos directly.

> Believe it or not, but the next big thing in digital imaging is to **UPLOAD YOUR PICTURES** on to a third-party website for all to see

This surely has to be the way forward. Forget carrying loads of memory cards or notebooks around, and instead head towards the nearest photo uploading point. Simply insert your card and let the uploader suck it dry, transferring all your precious pics to the safety of a third-party website. Friends and family could keep track of your trip and order prints whenever they like, while you free up your card for taking more pictures.

While I'm interested in printing technologies, the bottom line is I want to see my photos with the minimum of effort. George Eastman, founder of Kodak, had the right idea in 1888, when he coined the phrase: 'You push the button – we do the rest.' Hopefully, it'll soon be this simple with digital photography.

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Oftel is under pressure to push BT into providing full unmetered access to the net, writes Barry Fox

The price of freedom

'Action taken to develop wholesale unmetered access,' trumpets Oftel. Embarrassed by his past commitment to the Dome, PM Tony Blair looks for positive headlines by promising Internet access for everyone by 2005. Meanwhile, the head of Alta Vista resigns because he cannot deliver the unmetered access he promised, and World Online (formerly screaming.net) writes to subscribers warning that they may soon be metered again. Sky and ONdigital give away digital TV receivers to win Pay-TV subscribers.

These apparently random pieces of a jigsaw fit neatly together. Blair has admitted that he cannot use a PC and there are millions like him. Their easy answer is a modified TV. Sky's satellite Digibox was designed to connect to a phone line and run interactive services. But Sky's inappropriately named Open system provides access only to a closed walled garden of online shops and services controlled by Sky. ONdigital's boxes need an add-on unit, with extra memory and processing power, to provide interactive access. But the box can then access the open Internet. It was Blair's promises and Sky's lack of foresight that spurred ONdigital to commission and subsidise the Internet add-on. Digital receivers do not (yet) have disk storage capacity, but this makes them safe from viruses. The industry has now learned how to restructure fine texture Internet pages so that they look halfway reasonable on a TV screen designed to display interlaced PAL. For those who don't want digital TV, devices such as the Bush/Alba Internet TV do the same job on an analogue receiver for £200. So the technology is there for mass market access. Cost remains the problem.

Before Freeserve, anyone accessing the Internet had to pay an ISP up to £2 an hour or an all-you-can-eat flat rate of around £10-£15 a month, as well as paying BT (or a cable phone company) up to 4p a minute for a local phone call. Freeserve changed the rules by splitting revenue from 0845 local rate access, 50/50 between the ISP and BT, and then splitting its own share 50/50 with port-provider Planet Online. In April 1999, screaming.net tried to defy gravity by offering free off-peak Internet calls. The catch was that surfers had to ditch BT and sign up to use Localtel as their phone company. Localtel charged the same line rental as BT

(£8.92) and had to pay BT to use the local loop lines into subscribers' homes. Localtel thought it could still make money out of speech calls. It couldn't. Then BT offered free weekend Internet calls for line rental plus £11.75. In August, GreatXscape tried to mimic the screaming.net service, but ran out of money and by November had put a cap of 20 hours a month on free calls. In November 1999, CallNet offered free access on an 0800 number in return for a sign-up fee. It had to pay BT per minute and by January 2000 was trying to recoup losses by bundling the service with new PCs. In August, it gave up.

Alta Vista signed up hundreds of thousands of subscribers on the promise of a £60 flat fee, but never served one. NTL's service had insufficient capacity. Virgin promised, but never delivered. Line One, Liberty Surf, Breathe, Red Hot Ant and Eze Surf all closed down their unmetered services. In late May, Oftel responded to complaints from MCI Worldcom by promising FRIACO, Flat Rate Internet Access Call Origination.

This was supposed to let ISPs pay BT a flat, unmetered rate to shunt calls into other networks, like MCI, Energis or Colt. But BT said unmetered access to its Digital Main Switching Units (DMSUs), or trunk lines, would overload and crash the network. So BT continues charging per minute for routing calls between

> After the Dome fiasco Tony Blair can't afford the publicity that would come from **INTERNET ACCESS** for all that many cannot afford

Digital Local Exchanges and DMSUs. 'BT's lawyers were smarter than Oftel's,' is how World Online puts it. The company is losing up to £1,000 a month to BT on subscribers who leave their PCs online for 23 hours a day. Hence, the warning that the good times are coming to an end. Oftel has now hired independent experts to look at BT's claim that its network cannot cope with full unmetered access. In typically unplain English, Oftel says it will 'soon decide whether FRIACO should be provided at the DMSU'. This means that Oftel is under pressure from Number 10 to push BT into providing full unmetered access. After the Dome, Blair can't afford the publicity that would come from Internet access for all that many cannot afford.

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A permanent Internet connection may be great but it leaves you open to hackers, warns Brian Clegg

Gaining a sense of security

As I write this BT's OpenWorld service is at last going live.

You may have read recently in *PCW* about the thrills of high-speed ADSL connection, and when you experience it for yourself your whole view of the Internet changes.

This is partly because of fast downloads, but also because you're always connected. It's wonderful. You can have constantly refreshing live updates to your desktop, keep the web radio playing all the time, even cope with Microsoft's relentless output of super-megabyte upgrades. But what it's easy to forget is that a permanent Internet connection makes you a ready target for hackers. And before the complaints roll in, I'm using the term in the context of 'crackers' – people with malicious intent (whenever I write 'cracker' I unfortunately get the horrible picture of Robbie Coltrane, crouched over a hot modem).

Generally speaking, hackers get less publicity than

> Generally speaking, **HACKERS GET** less publicity than viruses – but don't let this fool you into thinking they don't exist

viruses – but don't let this fool you into thinking they don't exist.

It's fascinating when you read the account of one of the world's most active hackers in *@Large*, a book written by David Freedman & Charles Mann. What started as a small irritation at the Portland Center for Advanced Technology became an onslaught across the world. By sheer force of repetitive action, just one person broke into thousands of computers with frightening ease. He even hacked into Sun Microsystems and stole the source code of the Solaris operating system with the aim of slipping in a secret entry point (luckily he hadn't the technical knowledge to succeed). Though the authorities knew who he was, it took months before he was taken seriously.

Hackers are real and out there, ferreting around the Internet 24 hours a day.

For a long time I assumed that the hacking fraternity was only interested in Unix. Unfortunately, it's simply not true. Unix used to be the prime hacker target, because it dominates the Internet.

However, things have changed a lot in the past five years. With many more Windows and NT systems on the Internet and more of us getting always-on connections, the Microsoft operating systems have become prime targets. Even if you haven't adopted ADSL or a cable modem it's still possible to be hit during a long connection.

There's good news and bad news. Many of the hacker's traditional gateways are unlikely to be available. FTP and Telnet will not get you into the average Windows PC. But there's no room to be smug about this, because Windows has a gaping hole that can open it to Internet prowlers.

Anyone with a disk set up for Windows file sharing is potentially at risk – and surprisingly often this happens on PCs that aren't even in a network. If you have a network, perhaps you, like me, assumed it was enough to password protect your disks. Unfortunately, there are also plenty of password-breaking programs available – in fact, the existence of a password can act as a goad to some hackers.

The problem is the mechanism that Microsoft devised many years ago for small-scale networks. At the time, there was no thought of PCs having external connections that might hijack the local scene.

Unfortunately, that's exactly what can now be done. Any shared disks you have are probably open to anyone on the Internet who has the appropriate scanning software.

If you are worried about your security, you can make a couple of quick checks. Open the My Computer icon on the Windows desktop. Look at the icons for the hard disks of your PC (you may need to switch to large icons to be able to see them clearly). If any of them has a picture of a hand under the disk, it is enabled for sharing – chances are, the outside world can see in. Luckily it is entirely possible to block outside access, even if you need file sharing.

There's an excellent step-by-step guide to doing this at Steve Gibson's Shields Up site. Go to www.grc.com and click on the Shields Up banner. The site can probe your PC and see if it is vulnerable, and has all you need to feel much more secure. Alternatively, you can trust to luck. But it's not a strategy I would recommend.

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Nik Rawlinson wonders who benefits most from the ad banner app running on his desktop

Time to dump banner ads

All the time I'm online, which with my cable modem now means 24 hours a day whether I'm at my PC or not, there's an advert banner running on the bottom of my screen. I give up some desktop real estate to house it and each month receive a small financial kickback. But lately I've been asking myself who's been getting the better deal, and if I'm actually being duped into corporate censorship.

It's a simple system. As I drift aimlessly from page to page, it watches, quietly reporting back to a server on the other side of the world, keeping track of my movements and building a profile of my viewing habits. By now my profile must be pretty far reaching, and it'll tell them that I bought books from Amazon, read the BBC news and sent messages through Hotmail. It's upfront about it, explaining exactly what it keeps an eye on – everything from the page I'm browsing to the amount of memory I have installed and even which applications I'm running.

> **As I drift aimlessly from page to page, the advert BANNER WATCHES,** quietly reporting back to a server on the other side of the world

Everything it knows about me, it analyses, and uses to serve up adverts that match my profile, ensuring I only see what it knows will interest me. It's a good idea in principle and the advertisers probably love it, but in practice it stops me ever again making a random discovery. I've never visited a chocolate website, but that doesn't stop me liking Mars bars and if a new one is released I'll never find out because the ad won't match my profile.

This may sound extreme, but what if it wasn't my PC but my TV? At the start of September, New Jersey-based ACTV announced a global rollout of SpotOn. This delivers targeted adverts matching a viewer's profile. In theory, two neighbours could be watching the same programme, but see different ads, depending on compiled demographics stored in their set-top boxes. Interestingly, if you visit the SpotOn site at http://spoton.actv.com/ and click on the list of benefits you'll see that nowhere does it talk about any kind of a benefit to the viewer beyond the fact that it

will reduce channel surfing because we'll only see relevant things.

Potentially more worrying, though, is what would happen if programme makers started abusing TiVo-like devices. A TiVo box (www.tivo.com) sits between your TV and incoming programme streams, whether they be from a cable box, satellite decoder or standard aerial coax, and connects to a server through standard phone lines. Every day, it calls a toll-free number and downloads listings information that allows it to categorise each programme on the many hundreds of channels available. These will be compared to your profile so it can suggest what you might like to watch, or even record programmes off its own bat. The only shows you watch now are 'time shifted'.

This does deliver true benefits to the end user – tell it you like *Frasier* and it will record the whole season for you, even if the series switches from Fridays to Tuesdays halfway through. Similar systems have been in place for some time in many US households, and the worrying thing, for advertisers, is that they make it very easy for you to skip the adverts entirely. TiVo's site quotes Matthew, a software engineer from Cambridge, Massachusetts: 'I wouldn't want to watch TV without a TiVo any more. I don't watch commercials now.'

In the end, this can lead to only one thing – product placement – the blatant promotion of branded products in the programmes themselves. If you've seen *The Truman Show* you'll know what I mean. This, in turn, throws up perhaps the most worrying problem of all: programme makers have to make sure you watch their shows so you see the embedded products, and the easiest way to do this is lie about their content on the schedules so they fit into as many categories as possible, much like the way site designers throw in a handful of 'sex' meta tags at the top of every page to be scooped up by the search engines. *Frasier*, then, could be described as a 'medical comedy drama', which could match it to the profiles of anyone who regularly watches period dramas, Victoria Wood or *Casualty*. Suddenly, TV becomes as hard to navigate as the Internet and we'll be wishing we were back in the safe old days of four channels and a Betamax.

I'm doing my bit to save TV. I'm deleting my ad banner app as soon as I've filed this column. To hell with the £3.50 I've earned this month – there are more important things at stake. Richard and Judy, for a start.

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letters

BIASED TESTS?

After reading the 14-strong graphics card round-up in the October issue of *PCW*, I was a little disappointed to see that my card, the Voodoo 5500, scored so low in your test results.

However, after reading the test system specification and the software used when testing, I understood why.

3DMark 2000, Quake 3, and Test Drive 6 are all optimised for Transform and Lighting (T&L). In my opinion, this would make the tests biased towards the GeForce cards. If this is the case, can you please explain to me how a fair assessment of the card's performances can be drawn from these results? Why not use games like Unreal Tournament or Motocross Madness 2 to test the cards instead?
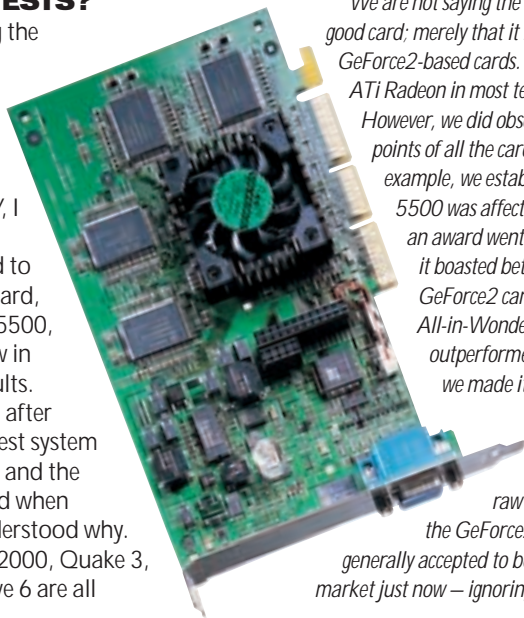
Many popular games aren't optimised for T&L. In fact, Quake 3 and Test Drive 6 are about the only ones that are. Granted, nVidia says more games will support T&L in the future but by then the GeForce3 will have been released and the Voodoo Rampage (which will have one or two T&L engines on it depending on the model) will also be in the shops. Only then will tests with T&L optimised games be fair.

ANDREW BECK

SCOTT MONTGOMERY
replies >

The main factor for our choice of test games is that they offer 'time demos', which allow us to exact a figure for the card's performance rather than relying on a feeling of how good it looks or how fast it seems. Admittedly, both 3DMark and Test Drive 6 have T&L elements, but this was not the sole motivation for their selection.

We are not saying the Voodoo 5500 is not a good card; merely that it is outperformed by the GeForce2-based cards. The same is true of the ATi Radeon in most tests, yet it has T&L. However, we did observe the good and bad points of all the cards submitted. For example, we established that the Voodoo 5500 was affected least by FSAA; and an award went to the Radeon because it boasted better features than the GeForce2 cards. Although the ATi All-in-Wonder 128 Pro was outperformed by almost everything, we made it clear that it still has its place as a versatile card.

Overall, if it is raw speed you're after, then the GeForce2 is your card. It is generally accepted to be the fastest chip on the market just now — ignoring the GeForce2 Ultra.

SKILLED BUT OVERPRICED

A recent news report told how depression is widespread among call centre workers. It's hardly surprising considering the constant pressure they are under to achieve their targets.

However, what did surprise me was the fact that by next year the industry will employ over one million people.

Of course, it's good to see an industry that's actually growing. Coal and steel have virtually disappeared in the UK and much of our manufacturing industry has died or been relocated to south-east Asia. Although the Industrial Revolution started in this country, there is little evidence of it now. We simply can't compete with countries using cheap labour. That's why it's good to have a government committed to the new technological age.

Schoolchildren are to have more of their education devoted to computers and the Internet. Intensive training during the last year of school, tailored to chosen careers, will not only benefit our children but also their future employers. Companies are being told to get online or be left behind. Ebusiness is the way of the future! Within a few years we should have a country crammed full of people with computer skills and companies crying out for them. That's the theory – but there is a cloud on the horizon.

Royal Sun Alliance recently moved its accounts department to Bombay, making 50 UK workers redundant. Given that a worker in Bombay earns approximately one-fifth that of their UK counterpart it makes economic sense. With communication costs set to fall, especially when it comes to international calls, the writing must surely be on the wall for UK call centres.

We could see many other companies follow suit – what is now a very small trickle could soon turn into a torrent.

I wonder how long it will be before one of our call centres relocates to India or some other country that can provide 1,000 English speaking operatives? I would imagine the banks

THE PLUS POINTS OF MP3

There has been a lot of bad publicity recently regarding music piracy and the MP3 format over the Internet. This is particularly true of fly-by-night websites illegally offering free downloads of material by popular bands.

The spirit of MP3 is to distribute and promote the music of unheard-of, unsigned bands, and there is a lot of excellent music out there for anyone prepared to sift through the dross. This is a good way both to broaden one's musical horizons, and to bring fine music to popular attention. With so much high-quality, bona fide MP3 music available on the Internet, why then do some people feel the need for piracy?

It has come to the point where record companies should stop seeing MP3 as a threat and recognise its potential. At a recent computer fair, I noticed one enterprising dealer selling 'entire discography' MP3 CDRs – the music of bands like Deep Purple, Pink Floyd, and Jethro Tull crammed onto a single CD in MP3 format. Naturally it was pirated material – but the fact is, it was exploiting a market niche so far ignored by record companies. The best these huge and fabulously wealthy organisations can offer us today is the chance to buy back catalogue albums all over again, digitally re-mastered and with long-forgotten single B sides as 'bonus' tracks.

Consider a typical back-catalogue album: 40 minutes of music, 40 minutes of unused CD space, and a price tag out of all proportion to its relative value.

It's about time record companies realised that the next move they must make is a positive one. Consumers must also approach the MP3 medium responsibly. Banish MP3, and something else will come along to take its place. History repeats itself, because the music industry is more interested in making money than taking initiatives. Remember all that wrangling in the 1970s when hi-fi manufacturers introduced two-deck cassette recorders? Let's hope the same doesn't happen again.

BEN HAVICON

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must be at least considering the idea, and once one company moves the bulk of its computing operation I believe the rest will follow.

We are banking heavily on new technology to provide jobs – it's our only real option. So, it's ironic that we're investing in the very technology that makes distance and location almost irrelevant. Globalisation – the exchange of ideas and technology and trading without borders – is a much talked about subject. The bottom line is that large companies will use the cheapest labour available, and if this is in another country then so be it.

I fear that, as a nation, we may find ourselves skilled but overpriced.

ALAN AITCHISON

RICHARD MCPARTLAND
replies >

While I agree that saving money is a top priority for most UK companies, I don't quite see a mass exodus any time soon. I'm not sure it's that easy to locate a fundamental part of your business in another country or that communication costs are falling on quite the scale you seem to suggest.

Many companies based in the south east, London Electricity for example, have chosen to site at least some of their call centres in parts of Scotland or north-east England because research has shown callers find these accents friendly, there's a huge potential workforce to tap into and costs of living are (and therefore wages can be) cheaper. So long as this is the case, I can't see too many companies wanting to go to the hassle of moving to another country with all the red tape this could involve.

SHOPPING THE WORLD

Having had Internet access for a number of years, I have only recently started to dabble in ecommerce. With various government drives and media coverage encouraging the public to make better use of the Internet, new dot com companies seem to be springing up left, right and centre to cater for every niche in the market.

Generally, these websites offer a great service to customers as long as you live in the country in which the website is based and, in general, you get the same level of service you'd expect if you'd bought the product from a high-street retailer.

However, making a recent purchase from a website based in the US proved there is still a grey area that needs to be resolved in terms of product support.

I purchased a new Sony digital camera from a US retailer. The product arrived within a week in perfect working order, with original Sony seals. When trying to register the product for the warranty in the UK, however, I discovered that in fact I was not entitled to any form of support or warranty whatsoever. On further research, I found that it is commonplace for many big multinationals to only offer support when the product is used within the country where it is sold.

While it is unsurprising that small companies can only offer warranties in the country of purchase, larger companies with multinational outlets should have a responsibility to offer after-sales backup regardless of where the product was purchased. An identical camera purchased here would have had a year's warranty from Sony.

This really dampens my enthusiasm for international ecommerce as it means that I am getting a cut-down product package simply because of where I live. As ecommerce begins to gain credibility in the UK, this short sightedness on the part of multinationals will leave people wondering whether the potential financial advantage is outweighed by the risk of being left stranded with a faulty product and no backup.

The Internet and its ease of use has made people venture out to make purchases internationally. Unfortunately, it seems that companies may use this as an excuse to neglect their duty to the customer.

KIERON COOKE

EASY PC

I disagree with David Sanders' letter (Letter of the Month, *PCW*, October 2000). I have owned the same PC (my first) since 1997 and I have never had any genuine reason to open the config.sys or autoexec.bat files in order to get a game to run. All the games I have bought in that time (Quake 2, Motorhead, Toca 2, SWAT 3, Worms 2, Quake 3, and Motocross Madness 2 to name but a few) have needed me to do nothing more than insert the CD, click OK or Next a few times or maybe reboot. Simple, straightforward stuff.

In fact, the PC I had in 1997 is still running the latest games with just a few low cost upgrades – more RAM (64MB), a faster CPU (Celeron 433MHz) and a new graphics card (Voodoo 3) – the cost of which at the time amounted to less than the cost of upgrading from a PlayStation to a Dreamcast. I admit, the initial cost of the 233MHz Pentium II was much higher than a games console, but I needed to be able to word process and browse the Internet. Incidentally, both of these tasks have been double-click exercises for many years on the PC. I click on the Word icon to write a document and with its simple icon bar I can easily complete basic tasks. To connect to the Internet, I just had to insert a CD from my ISP and, after typing in a few details, I was online. Now the Internet is easy – I just click on the Internet icon and I'm there.

The simple truth is that PCs are now no harder to operate than your average washing machine once you have

Motocross Madness 2: Easily installed

mastered using the mouse and getting to grips with a few icons. I've never had to fiddle with it to get it to perform the basic tasks; it's when people fiddle that things start to go wrong.

The reason PCs have only penetrated two out of 10 homes is that people feel they have no need to pay for the extra features they provide. If you can play games, access the Internet, use email and watch DVDs on a set-top box, then why pay the extra for a PC?

Many people claim that PCs are overpriced, but for the amount of (often unused) potential to do things that comes with them, I feel they are fairly priced. Many people have no need for the extra features that come with a PC. It simply isn't true that they're too complicated to use.

I think David Sanders is confusing the word 'simple' and the phrase 'simple to use'. Any device that has been made 'simpler to use' is usually more complicated – think of an automatic gearbox compared to a manual one. Simplification of use can only be carried so far; otherwise the problems due to device complexity outweigh the gain in operability, or indeed are insoluble. For instance, I've had people who couldn't send me an email because they can't copy a printed address accurately; how could you 'simplify' illiteracy?

Unfortunately, there are programmers or marketers in love with techniques, who manage to make things more complicated and less easy to use, and this does need dealing with, say by employing an ergonomicist. As Albert Einstein once said: 'Things should be made as simple as possible, but no simpler.'
B PRIESTLEY

WELL-WARRANTED PRAISE

Imagine this. You've bought a new £1,600 Pentium III PC. It performs really well and has loads of storage space. Then, after three months the four-speed DVD drive goes kaput. No problem – it's under warranty. Call the supplier, who after a quick diagnostic agrees to issue a replacement. Two days later it arrives as promised. New drive fitted, all OK for another four months. Groan. Call the supplier again. Same experience and same quick service. Well that's what you'd expect for a machine that's under warranty, right? After 12 months 15 days, the same thing happens again. This can't be coincidence.

I look up the drive on the Internet and find that many others have had the same experience – apparently this particular unit is well known for this kind of problem. With a heavy heart I ring the PC supplier again. 'I know it's out of warranty, but this DVD drive has a known history of unreliability. Will you

replace it?' – 'Yes'. 'Can it be a different model?' – 'Yes', again! No charge and return postage paid. So I am now the proud owner of a PC with a Pioneer 16-speed DVD drive. And who is the PC supplier who provides this truly exemplary after-sales support? Viglen – its HomePro PC is not bad either!
BRUCE LEVITAN

FREE ACCESS IS A LIFELINE

I was surprised at Nik Rawlinson's attitude in his reply to the letter about LineOne and the 'abuse' of its service (Letters, *PCW*, October 2000).

Free access for the disabled is essential

While I would agree there are certain people who will take advantage and leave their machine connected 24-hours a day, there are many others for whom the Internet is a lifeline.

Following an accident, a friend of mine is now a quadraplegic, and the Internet has become his main source of information and friendship. By use of converted equipment he is able to enjoy 'normal' activities, such as talking to someone. Chat, webcam and newsgroups have brought a new dimension to his life. Free access means that his parents do not have to field the massive bills that would normally be associated with heavy usage.

For him a two-hour online barrier is like saying to you or I that every two hours we have to start again. There are many others in similar situations, so please think about why some people give free access heavy usage.
PHIL INGHAM

CLARIFICATION

In our November review of Silicon Graphics' 230 Linux workstation we printed the starting price for the range, rather than the individual product's price. The 230 costs £4,023.20 inc VAT.

REVIEWS

contents

More power to your AIBO?

Jason Jenkins
SENIOR STAFF WRITER

Previewing the second-generation AIBO (see overleaf) set me wondering about the what the future holds for such devices. Speaking to Satoshi Amagai, president of the new division set up within Sony to foster future generations of AIBOs, left me in no doubt as to Sony's strategy. He wants to develop a new 'culture of AIBO' and referred to Sony's own Walkman to illustrate his point. Most people, he said, don't say: 'Can I borrow your personal stereo?', they usually say: 'Can I borrow your Walkman?'

In a similar fashion, Amagai wants to eradicate the notion of Sony's AIBO and replace it with simply the AIBO. Sony

might be safety implications if it goes too fast – an AIBO that mows down your baby as it chases its pink ball won't make great headlines. Likewise, he says, producing a larger robot has similar implications; should it topple over it could injure someone. I agree, of course, but speed isn't the only issue here. A truly mass-market AIBO needs to be much more flexible and capable of walking around a typical house unassisted, but I get the feeling that there's still some way to go before that happens. Until the company addresses these kinds of issues, my guess is that AIBO will remain an interesting spectacle, but not something most will want to buy. When Sony removes the limitations, though, an

An AIBO that mows down your baby as it chases its pink ball won't make great headlines

intends to achieve this through clever marketing, so if you're the kind of person who wants to kill all the Pokemon, Mutant Ninja Turtles and Action Men out there, then get prepared for a new enemy. Sony plans an AIBO blitz over the next few years, so brace yourself for AIBO songs, AIBO books, AIBO cartoons and probably AIBO toilet paper. The plan seems to be that, if you don't think you want AIBO now, you soon will, or at least your children will.

But even a marketing blitz can't make AIBOs fly off the shelves. Although undeniably a tremendous achievement, there are several things that need to happen before we see the mass-market adoption of entertainment robots. The main key to this is price: most people will admire AIBO from a distance, but wouldn't pay the money required for a device that still has a fairly limited application. But there are other factors as well. Again, although AIBO's movements are very impressive by today's standards, it is no *Speedy Gonzales*. Amagai says that Sony could produce a faster robot, but that there

autonomous creature that you can train will be very appealing. Unlike a mammal, AIBO does not leave a nasty mess on the floor and if you get fed up with its character, you can swap it for a new one.

There's another question that raises itself, though, and that is whether our homes will ever be populated by domestic robots designed to perform life's tedious chores in our stead? If they do, they won't be Sony's – the company is only concentrating on entertainment robots. But the field is open to other companies to try. However, I'm not so sure that we'll ever see this kind of robot in our homes. Leaving aside the technological problems of producing such a product, a domestic robot would have to be extremely cheap to compete with the cost of hiring a human to do the same job, or even (shock horror!) doing it yourself. Humans have other advantages as well; you don't need to program them to clean and if they break down, they don't need to go back to the supplier – instead, a few days in bed normally does the trick. In the world of technology, though, nothing is certain.

ratings

★★★★★ **EXCELLENT**
★★★★   **VERY GOOD**
★★★   **AVERAGE**
★★   **BELOW AVERAGE**
★   **POOR**

Second-generation AIBO

It may look more like a cat than a dog but the latest generation of AI pet knows how to play ball

Cast your mind back a few months to our May issue, and you may recall Sony's first-generation AIBO (pronounced eye-bo). This was a fully working example of artificial intelligence, produced to entertain those that owned it. AIBO could make autonomous decisions and express a kind of emotion based on the stimulus it received. It was capable of learning, remembering and developing a personality of sorts. Essentially, it was the closest you could get to owning a dog if the thought of the real thing didn't appeal.

Although we loved it, at the time we thought it was more of a PR stunt than anything else – a demonstration straight from Sony's research and development labs, exclusively for the rich. 'Nice idea, but that's the last time we'll see one of them', was the general consensus in the *PCW* offices.

How things change. The first AIBO was a tremendous coup for Sony in many ways. Yes, it was a tremendous PR vehicle, ensuring that the company

design, but does not look or feel so unwieldy. We put this down to three main changes: its ears, tail and weight. Instead of the floppy ears of the original, this AIBO has alert, movable ones – more on which later – and the tail is shorter. Some have commented that these make it look more like a cat than a dog this time around. The whole unit only weighs 1.4kg, compared to the 1.6kg of the original. Most of this can be attributed to AIBO's lighter lithium-ion battery, which has moved from the rear to underneath the creature, along with the memory-stick slot.

Sony has also done away with the fan – customers said that they found it too noisy. The second generation comes in three colours: black and silver like the original as well as a new gold colour.

The biggest innovation of the second-generation AIBO is voice recognition. Each AIBO can be given a name. Once you have recorded it, calling out the name will cause it to respond, possibly by coming over to see you or by turning its head in your direction. This is where

with AIBO. Most important are the three touch sensors (up from one on the previous dog) located on its head, back and under its chin. Stroking these indicates that you are happy with AIBO – if it has just performed a trick, for example, it is a good way of rewarding it, and encouraging it to do more. Tapping them harshly indicates that you are not happy.

How you use these sensors really does have an effect on AIBO's personality – give it too much affection and you'll be stuck with a lethargic, self-satisfied creature that won't do much. Ignore it and AIBO could become a withdrawn pet, shying away from human contact. Scold it too much and there's a danger that you could create a resentful, snappy, monster. But that's half the fun.

There's also a tiny digital camera located in AIBO's head. Say, 'take a picture' at AIBO, and it will take a picture of what it sees at that moment, giving you the chance to build a whole library of your dog's life. This, together with the infra-red sensor gives the robot a limited ability to see the world – it can distinguish some shapes and colours. One is the famous pink ball. You can train AIBO to associate the ball with fun, and it'll happily play with it for hours, knocking it backwards and forwards in a very endearing way. Equally, if you hate the ball, you can scold it when it starts playing with it and eventually AIBO will ignore it altogether.

To understand its appeal, you have to see it in action and you can't deny that it's cute

received blanket media coverage. But it was also a highly desirable product, even if its price put it out of reach of most people.

It was at this stage that Sony realised AIBO was no one-hit-wonder, and that, handled well, it could be on to a serious winner. To achieve this it has formed a new business unit, the Entertainment Robot Company (ERC), which is dedicated to producing the next generations of AIBOs.

To mark the occasion, the president of the new division, Satoshi Amagai, invited us along to have an exclusive chat about the direction his new unit is heading, and to show off his new baby, the second-generation AIBO.

Also known, somewhat unromantically, as the ERS-210, the second-generation AIBO incorporates new technological advances, together with customer feedback from the last model, the ERS-111. This AIBO looks to us like a sleeker brother of the original. It maintains the same basic shape and

the movable ears come into play – the microphone in AIBO's head can detect the direction of sound and the ears will twirl toward the direction of the voice, just like a real animal. You can teach AIBO to recognise up to 40 words as it matures. AIBO can also respond in its own tonal language – basically a series of endearing beeps. It can also imitate the sound of the words you say, again using its tonal language.

The way in which AIBO moves around has not changed. Although this second generation has an extra two degrees of movement over the previous model – making 20 in all – these are accounted for by the ears.

When you buy AIBO, it is nothing more than a defenceless puppy. It is up to you to train it, and develop its personality. There are two main ways to interact

AIBO is capable of expressing six emotions: happiness, sadness, anger, surprise, fear and dislike. These are communicated through body language, speaking its tonal language and the LEDs in its head and tail. The LEDs in its tail are new and there's an extra set in its head to help it be more expressive. A further lamp in the AIBO's head indicates when the batteries are low.

The most important part of AIBO is its memory stick. All the data relating to its personality and the pictures it takes is stored on this. Sony has decided to introduce yet another colour variation – AIBO needs a bright pink memory stick. This is only designed to contain files that pertain to AIBO, and the files are encrypted to prevent copying. Incidentally, the encryption method is different to that found on the white memory stick used in Sony's memory-stick Walkman.

Part of the reason for the encryption seems to be that Sony will release a whole bunch of software for use with the new AIBO, so if you could simply download files from the Internet for free, that source of revenue would be lost.

The most important of the new programs will be AIBO Life. This contains a pink memory stick preloaded with all the information AIBO needs to act like a puppy, and it will record all the training you give the robot. Other programs include Hello AIBO, which will contain a memory stick incorporating some performance moves, and Party Mascot, for times when you're stuck for a partner with whom to play scissors, paper, stone. If you want direct control over your little pet, though, you'll have to shell out for AIBO Master Studio, available after the launch, which gives you the ability to mould AIBO's actions as you see fit. Using the advanced program you'll be able to control all the creature's motors, expressions and sounds, storing the results on another memory stick.

To use any of these programs, you'll need a memory stick slot on your notebook, or a PC Card slot for the PC Card memory stick adaptor. At least, you will until February next year when Sony brings out its wireless option for AIBO. The second generation has a PC Card slot inside it, between the rear legs. The 802.11b wireless LAN card will be just the right size to fit inside this, and will mean that, if your notebook or PC also has an 802.11b capability, you'll be able to control AIBO directly without the need to swap memory sticks. Sony wanted to integrate Bluetooth into this version, but unfortunately delays with the standard put paid to this idea.
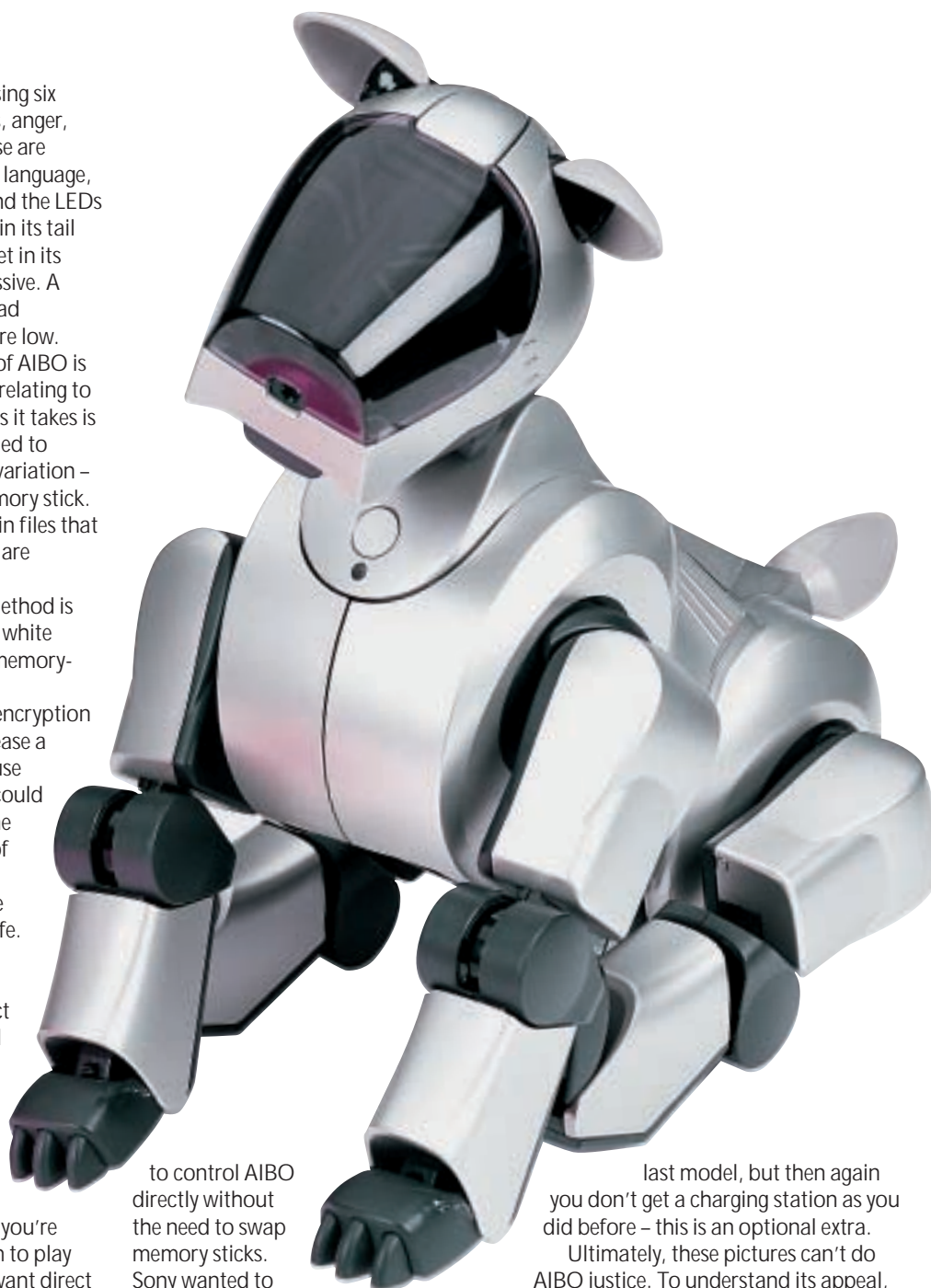
The second-generation AIBO will be available on 16 November for a limited time only, and this time you'll be able to buy it from the website – www.aibo.com – or by phoning Sony direct. Sony promises that everyone who places an order one will receive one, but won't be drawn on how long the offer will last.

At the time of writing, pricing had only been announced in euros. Sony will be selling various bundles, but as a bare minimum you'll need the ERS-210 unit itself, which comes with one battery and one recharger, and a copy of AIBO Life, priced at 1,590 euros ex VAT. This equated to about £1,000 at the time of writing, a fairly substantial saving on the last model, but then again you don't get a charging station as you did before – this is an optional extra.

Ultimately, these pictures can't do AIBO justice. To understand its appeal, you have to see it in action and you can't deny that it is terribly cute. The model we were shown only had limited functionality, so we can't award any stars, but we can't wait to take home the finished product.

JASON JENKINS

DETAILS

PRICE Estimated 1,590 euros ex VAT
CONTACT Sony 020 7365 2938
www.aibo.com
PROS The ultimate example of artificial intelligence at work
CONS Throw a stick into the distance and shout 'fetch', and you won't get very far
OVERALL The second generation looks to be a triumph of technology. It's ideal for the person who has everything

Mesh Matrix D800S

The first 800MHz Duron machine boasts some features that make it stand out from the crowd

Starting with the important stuff, the D800S, perhaps not surprisingly, features an AMD Duron processor clocked at a healthy 800MHz, backed up by a now more or less standard 128MB of memory. This is the first time we've seen an 800MHz Duron, and luckily it doesn't take a super-sleuth to uncover some nice touches that make it stand out.

Take the internal 3.5in drive cage. As it stands there's only room to install one further device, but rather than sitting in line with the rest of the case, as usually happens, it's been turned to face you when you've removed the cover so you can easily slide the drive in and out without having to scrabble around inside. Devices are also fixed on only one side, with the less accessible edge supported by a lip on the cage, so you only have two screws to remove when you're swapping them out.

The USB quota has been upped, too. There's the usual twin set loitering by the dual PS/2 and serial ports, but Mesh has taken advantage of the feature connector on the Asus A7V motherboard to add a further three, using a plate positioned above the AGP slot so as not to put any of the three free PCI slots out of action.

The memory is supplied in the form of a single module, leaving two slots free for future upgrades. The hard drive, meanwhile, is a 20.4GB Seagate unit, spinning at a respectable 7,200rpm. This is connected to the motherboard via the standard primary EIDE channel, and a Samsung DVD/CD-RW combo drive is hitched up to the secondary, but the motherboard supplements these with a further two UltraDMA100 interfaces – in this implementation neither is used.

In a sense it's a shame Mesh didn't opt for a full-tower configuration so more ambitious users could make full use of the motherboard's complete feature set. As it stands, there are two 5.25in bays free and, as mentioned, room for one further device in the internal 3.5in cage, but the motherboard offers potential for the connection of no

fewer than nine separate devices, including the floppy. Sadly, three of these would find themselves homeless here and be without a power connector. This is not really a criticism, it's just a shame the potential is wasted. That said, the interior of the case is very tidy with all loose cables tied back or clipped into place, which makes life easier if you ever come to upgrade.

Corporates will welcome the inclusion of a sturdy case lock, complete with two keys, but may wish to swap out the internal fax/modem for a network card. Home users should be happy to see it there, though, and Mesh has pre-installed Virgin.net sign-up software and added it to the Start menu, so you'll be emailing friends in no time.

We cannot fault the monitor, an excellent Mitsubishi Diamond Pro 720, which is a joy to use, benefiting from a Diamondtron NF aperture grille to produce sharp, crisp images and no discernible reflections. The fascia of this 17in monitor includes Mitsubishi's Fine Picture Mode button, which turns on a contrast-enhancing utility. Thankfully, the D-SUB cable used to connect the monitor and PC is not captive, so if it breaks at least you can still save the display.

The input peripherals are similarly

impressive: a scrolling Intellimouse and Microsoft Internet Keyboard with quick-access buttons to email and browser functions.

An OEM version of the ATi Radeon with 64MB of DDR memory drives the monitor. This OEM version is clocked slower than the retail version but has composite in and out, and S-Video ports. Sound comes via a Creative Sound-Blaster Live! 1024 and a set of PC Works Four Point Surround speakers. The OS is Windows 98, which is disappointing, but you do get Microsoft Works Suite 2000, which is far superior to the standard Works and includes a full version of Word 2000.

NIK RAWLINSON

DETAILS
★★★★

PRICE £1,291.33 (£1,099 ex VAT)
CONTACT Mesh Computers 020 8208 4706
www.meshplc.co.uk
PROS Versatile motherboard; excellent monitor; fair price; composite in and out
CONS Motherboard's potential hampered by choice of case; no secondary optical drive for disc copying
OVERALL A keenly priced PC to suit all but the most power hungry

PERFORMANCE RESULTS

	0	100	200	300	
					140
SYSmark 2000					

	0	1,000	2,000	3,000	4,000	
						3,282
3DMark 2000*						

	0	10	20	30	40	50	60	fps	
									47.1
Quake III*									
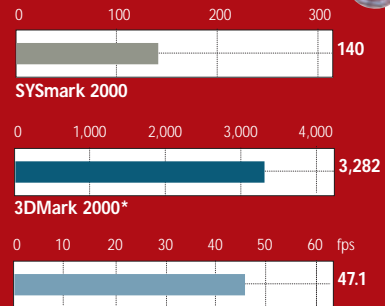
* 3DMark 2000 and Quake III are tested at 1,280 x 1,024 16bit colour and textures

Panrix Magnum 900

A value-for-money, high-performing Athlon system based on Asus' A7V motherboard

The people at Asus must be smiling these days as they sit on large piles of money following the runaway success of the A7V motherboard. The number of A7V-based systems that have come through our doors in the past few weeks is quite astounding – and the Panrix Magnum 900 joins the throng.

So what's so special about the A7V? Just about everything that's relevant to a good PC. The board has all the standard features you'd expect, although Asus is looking to the future by not including any ISA slots. Instead there is an AMR slot tucked near the bottom of the board, which it shares with the last of five PCI slots. Another forward-thinking move is the inclusion of an AGP Pro slot. The motherboard also supports up to seven USB ports. There are five as standard: two integrated and three on a back plate. The motherboard also has a Promise UltraDMA100 controller chip as standard, allowing the most up-to-date drives to use the bandwidth they are designed for. As for memory support, either PC100 or PC133 can be installed, with a maximum of 1.5GB of memory supported by the VIA KT133 chipset. As the basis of a system, this motherboard is one to look out for, supporting all the requirements of today's – and some of tomorrow's – cutting-edge peripherals.

The processor is a 900MHz Athlon. This is a good choice for a mid-range system: it is cheaper than a headline-grabbing 1GHz processor but still delivers blistering performance. There is 128MB of memory in a single bank of SDRAM, leaving two further DIMM slots vacant for upgrading. Thankfully, Panrix has opted for PC133 memory, so you won't need to throw away the memory you have to upgrade, but you'll only be able to fit a maximum of 1.12GB.

In two of the PCI slots are a Diamond SupraExpress modem and an OEM Creative SoundBlaster Live! 1024 sound card – without a CD SPDIF connector.

An OEM version of ATi's Radeon sits in the AGP Pro slot. This is different to the version we reviewed in our graphics card group test, since it comes with

32MB of memory onboard, clocked at 166MHz as opposed to the 183MHz of the retail version. This makes it slower, but the fact that it is DDR memory makes up for this somewhat, as this effectively means it is running at 332MHz. Unfortunately, it does not have the video in/out capabilities, although it will still be an excellent card to use if you want to view DVD videos on the monitor.

Speaking of which, the monitor is a Mitsubishi Diamond Plus 91. This 19in aperture-grille unit has a Natural Flat screen that displays an excellent image. It is capable of resolutions up to 1,600 x 1,200 at 75Hz. At 1,024 x 768 the picture is excellent both for working on the PC, and for viewing DVDs. The Cambridge Soundworks FPS 1000 speaker system also lends itself to home theatre use. Although not as high quality as digital surround systems, they are a fraction of the cost and give acceptable sound.

The 40GB Maxtor DiamondMax Plus is a respectably sized UltraDMA100 drive with a spindle speed of 7,200rpm. The system can make full use of this bandwidth with the Promise controller, so data transfer is very fast on the Magnum. The bundled Plextor Plexwriter PX-W1210TA is an excellent CD writer, which not only includes BURN-Proof technology to minimise disc wastage from buffer underruns, but is also one of the fastest writers available, boasting 12-speed writing, 10-speed rewriting and

32-speed reading. For optical reading of CD and DVD media, an AOpen slot-loading DVD-1640 Pro is installed, winner of a Highly Commended award in our August issue.

Although there are no free 5.25in bays free, this will not be of much consequence to most as the Magnum has full DVD and CD-RW abilities. There are two free 3.5in bays free for further hard drives. Performance in the Magnum is good overall. The 3D performance suffers slightly as a result of the OEM Radeon, but it is nothing to get too worked up about – you'll still get perfectly playable frame rates in new games, and the motherboard ensures that you'll be able to upgrade for some time to come. The software is a little stingy – all you get is a copy of Works 2000 (that means no copy of Word), and Windows Millennium Edition but, all things considered, this is a very good package for the price.

SCOTT MONTGOMERY

DETAILS
★★★★★

RECOMMENDED
PERSONAL COMPUTER WORLD

PRICE £1,275.75 (£1,499 ex VAT)
CONTACT Panrix 0113 244 4958
www.panrix.com
PROS Good motherboard; good components; good performance
CONS Software bundle could be better
OVERALL As a mid-range system, this has it all; good performance, upgradability and some of the best components available

PERFORMANCE RESULTS

	0	100	200	300	
SYSmark 2000					**163**

	0	1,000	2,000	3,000	4,000	
3DMark 2000*						**3,401**

	0	10	20	30	40	50	60 fps	
Quake III*								**47.8**
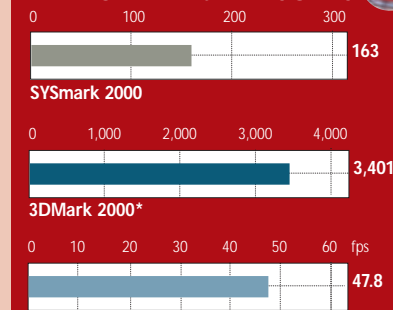
* 3DMark 2000 and Quake III are tested at 1,280 x 1,024 16bit colour and textures

HP Pavilion 8730

Performance is acceptable, but for the price and its upgrade problems this PC is no great shakes

Pavilions are geared towards home users, rather than the corporate market. They have a case that, although still decked in grey, is more interesting than a normal case, with a door to access the DVD and a top flap for storage of CDs. Ours had a monitor with speakers that clip to the side, as well as a special multimedia keyboard with volume and DVD/CD controls. HP is also proud of the Pavilion's ease of setup and use. The case even has two USB ports in the front, along with a serial port for simple connection of any peripherals.

We took a look at the top of the range model, the 8730, which comes in at £1,299 inc VAT. Everything seemed promising until we opened the case and found an interior littered with outdated components. The installed Slot A AMD Athlon processor runs at 850MHz – a respectable clock speed. However, this is not the newer on-die cache Thunderbird Athlon, but is the older version without on-die cache memory. Pre-Thunderbird Athlons have 512KB of off-die cache and suffer from a speed bottleneck in comparison to similarly clocked Pentium IIIs or Thunderbirds. The motherboard is a Slot A Asus K7M, which uses AMD's original 750 chipset. This, again, is not poor quality, but is not exactly cutting edge, supporting only AGP 2x and PC100 memory. As AMD is moving its entire product range to Socket A, you'll need a new motherboard if you want to change your processor.

There's 128MB of PC100 memory installed, leaving one DIMM free for upgrade. With five PCI slots and an AGP slot, two PCI slots remain free. The board does not support UltraDMA100, although this is of little consequence as the Quantum Fireball LCT15 is UltraDMA66 anyway. The hard disk is 30GB in size.

Occupying the other three PCI slots are the Creative SoundBlaster PCI 128, a V.90 modem, and an HP 10/100 network card.
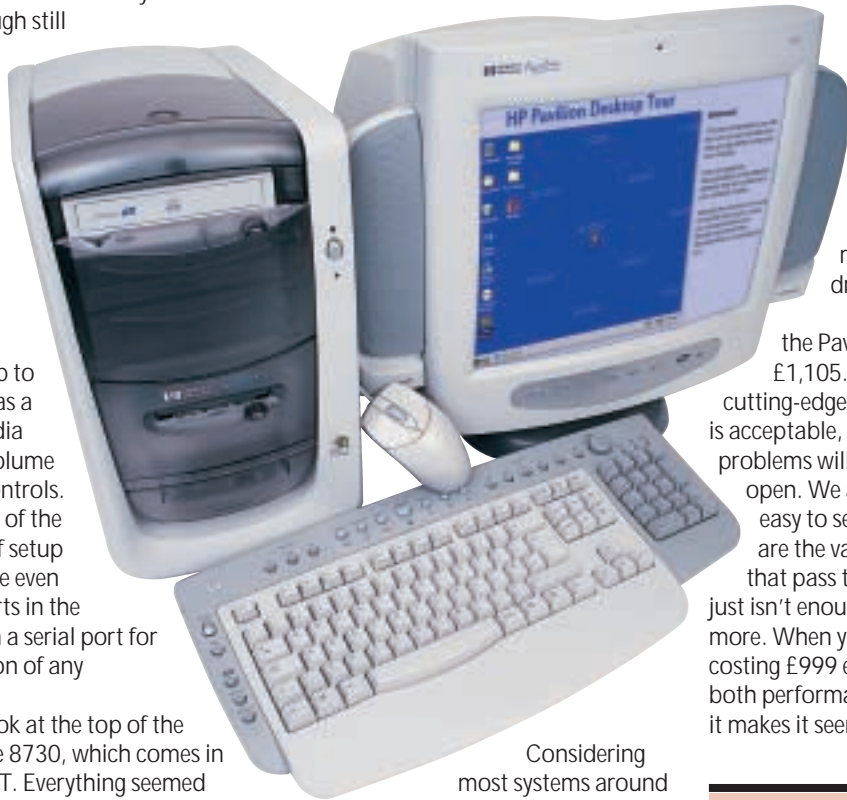
Considering most systems around the £999 ex VAT mark at least come with the SoundBlaster Live! 1024 card, the PCI 128 is another area where older components have been included. The Polk Audio speakers clipped to the side of the monitor are adequate.

An Asus TNT2 Pro card is slotted into the AGP slot. Considering the recent release of GeForce MX cards, the inclusion of the TNT2 Pro is a little weak, and its inclusion results in some fairly uninspiring 3D performance scores. In its favour, though, it does have both composite and S-Video sockets at the rear, giving it some versatility. The graphics pipe to the HP M70 17in monitor. This monitor is mediocre. The screen regulation is poor, with the whole screen image swelling whenever white areas are on the screen. The optical devices installed are an LG CD-RW and a Samsung DVD SD612. Both of these are acceptable solutions, although with four-speed write and rewrite, the writer is not as fast as you would want for the money. The DVD, though, is a pretty good unit, with 12-speed DVD and 40-speed CD reading. The bundle also includes copies of Works 2000, Money2000 and McAfee Virus Scan.

Upgrading our Pavilion was nothing short of a nightmare. Opening the case reveals a nest of cabling that will be tricky to negotiate and a funnel to channel heat from a fan to the Athlon – a necessary feature. The most notable problems are with memory. Even though there is a slot free, removal of both of the CD drives is needed to get at it. The bottom line is that the Pavilion is more expensive, at £1,105.53 ex VAT, than more cutting-edge systems. Its performance is acceptable, although upgradability problems will annoy when the case is open. We agree with HP that it is easy to set up and use, but then so are the vast majority of other PCs that pass through these pages: this just isn't enough to win awards any more. When you consider that systems costing £999 ex VAT can outstrip this in both performance and future-proofing, it makes it seem pretty unattractive.

SCOTT MONTGOMERY

DETAILS
★★

PRICE £1,299 (£1,105.53 ex VAT)
CONTACT Hewlett-Packard 0990 474 747
www.hp.com/uk
PROS Reasonable-sized hard disk; good DVD ROM included; network card and modem
CONS Outdated components blight other aspects of this PC; monitor is poor quality
OVERALL Based on specification and the money involved we find it hard to recommend this system especially when such good machines exist for £999 ex VAT

PERFORMANCE RESULTS

	0	100	200	300
SYSmark 2000			**147**	

	0	1,000	2,000	3,000	4,000
3DMark 2000*			**2,138**		

	0	10	20	30	40	50	60 fps
Quake III*			**22.3**				
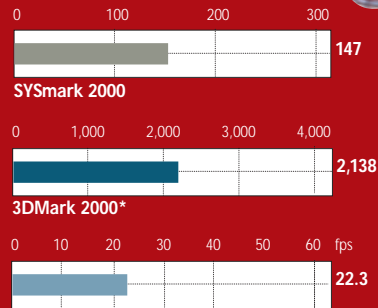
* 3DMark 2000 and Quake III are tested at 1,280 x 1,024 16bit colour and textures

HP Omnibook XE3

Catering to HP's corporate market, the F2118W/K will appeal in most business environments

It's that time of year when HP opts to refresh one of its Omnibook product lines, so this month we decided to take a look at the top-of-the-range model, the F2118W/K.

In keeping with its corporate target market, our review unit came pre-loaded with Windows 2000, but you can opt for Windows 98 if you want.

At the heart of the XE3 is Intel's 700MHz Pentium III mobile processor with SpeedStep technology. This allows the processor to run at two different clock speeds depending on whether the unit is powered from the mains or the 11.1v lithium-ion battery. The drop is a full 150MHz right down to 550MHz, helping to reduce power consumption. However, if this reduction in power makes you feel inferior then you can disable this feature in the SpeedStep utility under the Windows power management applet. Backing up the processor is 128MB of PC100 SDRAM, that can be upped to a total of 256MB. This helps the XE3 to a commendable score of 132 in our SYSmark 2000 test.

Sliding the display latch to the right and lifting the lid reveals a 15.1in TFT display that is a pleasure to use. The screen is bright, colours vibrant and everything is in focus and perfectly centred within the ruggedly-designed bezel. Providing the video signal is an S3 Savage/IX graphics controller with 4MB of onboard memory. Support for software MPEG-2 decoding is included, as is an integrated NTSC/PAL TV encoder for use in a variety of countries. Dual display output with a standard monitor is also possible thanks to the built in D-SUB connector located around the back. A composite TV out port is also present. The TFT has a native resolution of 1,024 x 768 resolution, and the notebook supports higher resolutions via an external monitor.

The keys are responsive and have

adequate travel. There's a very slight bounce to the bottom board but in general it's robust. Hot keys are present

for controlling brightness, screen swapping in dual display mode, and the volume. Extra one-touch buttons above the keyboard can be reassigned to launch any application, although initially are assigned to Internet-based programs such as email and the browser. Lying in the middle is a blue standby button, and the main power switch is to the left.

Pointer control is via a touchpad with left and right click buttons and an up/down scroll button.

A rather mediocre 10MB IBM hard drive caters for any storage and backup requirements, but this could fill up fast if it is used for multimedia purposes. In general, though, most businesses should find it adequate. A 3.5in floppy drive is on the left corner beside two slots designed for either one Type III or two Type II cards. A whole host of ports deal with connectivity. These include two USB

ports, serial and parallel ports, a PS/2 port and an IrDA-compliant infra-red port. On the right side is an integrated V.90 modem, and a 10/100 Ethernet adaptor. A docking port under the unit tops everything off.

Audio is handled by an ESS Allegro-1 PCI chip, pushing stereo sound out of the Polk speakers at the front of the notebook. The quality is decent for laptop speakers, but it's much better through headphones. In between the speakers, an LCD panel can display the date, time or percentage battery life. Beside this are the translucent blue buttons that allow you to operate the eight-speed Toshiba DVD-ROM drive. As for software, HP bundles MusicMatch Jukebox MP3 player, Mediamatics DVD Express, McAfee's Virus Scan and Smith Micro's QuickLink fax.

This version of the XE3 runs Windows 98 SE, and if you want a cheaper option it comes in a range of configurations. Comprehensive documentation and HP's recovery CD-ROM are bundled. On the whole, we feel that HP has gathered together a good selection of components and built them into a rugged unit that will survive the rigours of everyday use. Add to that HP's one-year global parts and labour warranty, and there's a good corporate workhorse here.

JALAL WERFALLI

DETAILS
★★★★

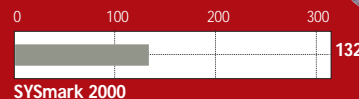**PRICE** £2,266.58 (£1,929 ex VAT)
CONTACT Hewlett-Packard 0990 474 747
www.hp.com/uk
PROS Rugged design; good performance; excellent screen; good range of ports
CONS Average-sized hard drive; keyboard could be a little firmer
OVERALL A fine machine that will appeal to most business environments

PERFORMANCE RESULTS

0	100	200	300

132

SYSmark 2000

Sony Vaio PCG-F709

This has everything the Apple DV editing machines have, but falls short in one or two respects

To kick off, how about a little trivia? Did you know that Vaio stands for Video Audio Integrated Operation? No company, with the exception of Apple, has pursued the Holy Grail of portable digital video editing with as much success as Sony. The Vaio range features integral IEEE 1394 ports, Sony's version of which is i-LINK.

As with desktop machines, only more so, three factors have stood in the way of practical mobile DV – processor power, graphics subsystem speed and hard disk size. With a 750MHz PIII, NeoMagic Magicmedia 256XL+ graphics with 6MB of SGRAM and an 18.1GB hard disk drive, the F709 has what it takes. Another drawback of video editing on a notebook is the screen size, but happily that isn't a problem with this model. The 15in TFT looks enormous and while it doesn't provide anything approaching the floorspace of a 21in CRT, working in Premiere doesn't feel cramped.

The Vaio range is well designed and solidly built but at 3.42kg this isn't one of the lightest models. Two bays on the right house a removable floppy drive and a fixed eight-speed DVD drive. If you don't make much use of floppy disks and prefer to travel light, you can replace it with a plastic 'weightsaver', or a second battery might be more useful.

Software playback of DVD video left a lot to be desired. Despite the screen being on its brightest setting, DVD movies were inexplicably dark. Also the viewing angle became critical – a few degrees either way and the image virtually disappeared, as though inserting a DVD movie transformed the screen into a cheap passive matrix model. Quality of playback was also noticeably poor, with blocking in evidence on flat coloured areas like walls.

Options for connectivity are good. The left edge sports two PC Card slots of the tray-mounting variety. To eject the tray you press the side button, prise it outward, then push it in. This can be a fiddly process, but then PC Cards aren't something you tend to insert and remove often – unless you don't use them much and want to conserve battery power.
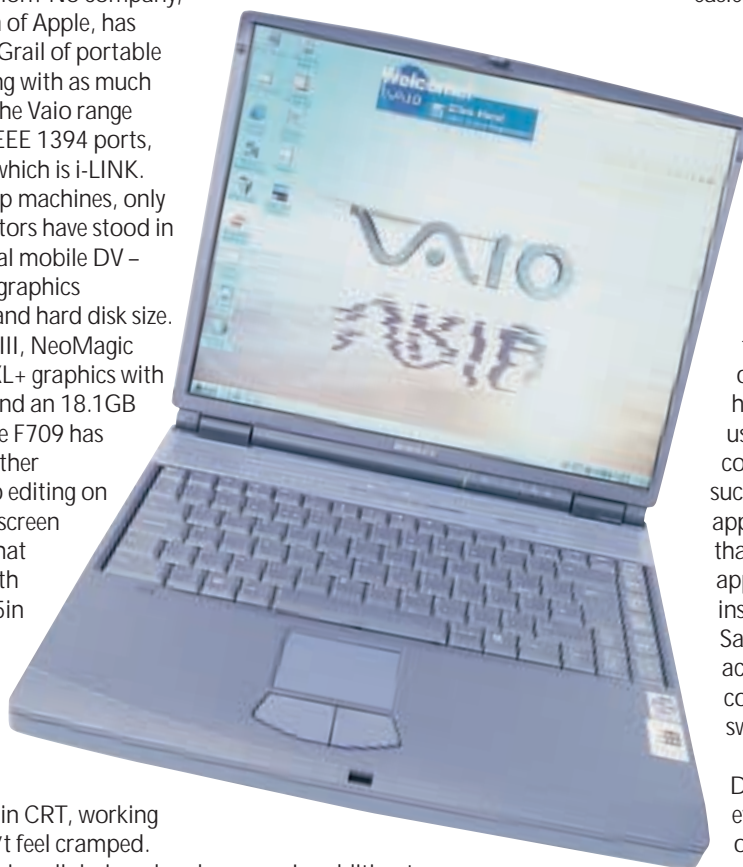
In addition to headphone and mic sockets, the IR and i-LINK ports are on this side of the machine, as is a composite video output. This seems an odd choice: surely on a mobile DV editing platform most people would prefer to have an S-Video output. Provision of a second i-LINK port would have allowed the connection of an IEEE1394 external drive, as well as a DV camcorder and in this the Sony is beaten by Apple's new G3 Powerbook.

Moving to the rear, there are two USB ports, the V.90 modem connector and a socket for an external keyboard or mouse. A panel cover reveals a serial port, printer port, IrDA port and VGA connector for an external monitor. About the only thing missing is a network connection.

The square touchpad is mounted in an extended 'wrist rest' area south of the keyboard and the two buttons below it were a little too close for comfort. Having said that, the software controls for the trackpad are among the best we've seen. One feature alone merits this description – the ability to turn off the tap function when typing. Trackpads typically allow you to tap to click – it's easier and quicker than using the buttons. But it's also too easy to inadvertently tap the trackpad when typing in text – repositioning the cursor, usually in the middle of an earlier paragraph, or in another window altogether, resulting in confusion if not worse. Usually you need to turn the tap function off if you want to write, but not with the Vaio.

The trackpad can perform other tricks too. You can change the orientation so that vertical becomes horizontal and vice versa. More usefully, you can assign the top left corner to one of several functions, such as Sony's easy capture application. There are also three keys that can be programmed to start an application on a certain event, such as insertion of a USB or i-LINK device. Sadly, these have a tendency to activate when you have a camcorder connected to the i-LINK port and switch from camera to VTR mode.

So if you're looking for a mobile DV editing suite, the Vaio has almost everything the Apple machines can offer, but falls short in a couple of minor, but important respects. What it lacks is a quality DVD movie player, and S-Video output. To add a final grumble, 2.5 hours from the standard battery isn't enough and Sony should throw in a four-hour one as standard.

KEN MCMAHON

DETAILS
★★★★

PRICE £3,000.95 (£2,554 ex VAT)
CONTACT Sony 0990 424 424
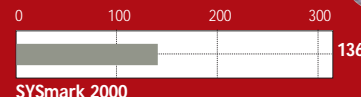**www.sony-cp.com**
PROS Big screen; good trackpad options
CONS Only one i-LINK port; no built-in networking
OVERALL Beautifully designed and well made, but as a mobile DV editing studio outperformed in lots of respects by the Apple G3 Powerbook

PERFORMANCE RESULTS

0	100	200	300
			136

SYSmark 2000

Hi-Grade Hi-Pad 131

A bit bulky and with a couple of glitches, this Pocket PC is nevertheless ideal for those on a budget

Microsoft's new operating system for the palm-sized device, Windows CE 3.0 has been available only on devices from three different manufacturers: Hewlett-Packard, Casio and Compaq. Until now, that is.

Systems integrator Hi-Grade has now thrown its own hat into the ring with its new Pocket PC, called the Hi-Pad 131. Unfortunately, this Pocket PC arrived in the *PCW* offices a little too late to make it into this month's group test, but it can easily hold its own with the models there.

The Hi-Pad 131 is about the same thickness and weight as the Casio Cassiopia E115 (see page 200). This makes it slightly hefty to carry around – you certainly wouldn't want to put it in your jacket pocket, for example.

That said, the extra thickness does enable it to offer a Type II Compact Flash slot, as opposed to the Type I slots found on HP's Jornada 540 series, and nothing at all on Compaq's iPAQ. This means that it can take an IBM Microdrive for up to 1GB of external storage. One application for this slot is shown in the picture – Hi-Grade also sells a Type II Compact Flash digital camera for use with the device. Costing £69 inc VAT, it's a nifty little unit and can swivel so that you can look at the screen and take snaps at the same time. It is more of a gimmick than anything else, to be honest, as the images provided by the manually focusing lens can hardly be described as good quality. The software provided to drive the camera looks as though it was written for CE 2.0: it places the start bar at the bottom of the screen. It's easy enough to use though, and would be an entertaining sideshow.

The Hi-Pad is driven by a 131MHz NEC MIPS processor, and has the standard 32MB of RAM and a 16MB of ROM. The 320 x 240 screen is all right, although not quite as well defined as that in Compaq's iPAQ. It works well enough though, and is capable of displaying 16bit colour.

As with all the colour Pocket PCs, it is very difficult to see anything at all without turning the backlight on, and there's a dedicated button for this on the left-hand edge. This switches off after a user-defined period of time. Adjusting this, however, is something of a problem.

If you try to get to the backlight settings through the power applet in the settings menu, as is standard with Pocket PCs, you get an error. You have to use Hi-Grade's own Advanced Settings program to achieve this.

There are plenty of shortcut buttons: the left-hand edge sees power, jog dial, start key, quick voice record, and backlight buttons together with a headphone socket and DC in. An IrDA port is situated at the top of the device, and the adequate stylus slides into the top of the chassis, the same as the Casio. A microphone is situated at the front. The four buttons on the front of the unit can be redefined, but are by default set to open up programs such as tasks and contacts.

The lithium-ion battery has a quoted battery life of 7.5 hours. There's also a backup battery to protect your data if it runs out and, uniquely, should this run down it does not need replacing – it simply recharges itself the next time you plug the Hi-Pad into the mains.

Synchronising the PDA is extremely easy, as with all Pocket PCs. The Hi-Pad comes with a docking cradle that, if plugged into the mains, serves as a recharging point too. Unfortunately, the interface is serial, not USB, so expect file transfer to be slower. The Hi-Pad comes with the latest version of ActiveSync for this purpose.

The device has the same mammoth level of software loaded on it that other Pocket PCs have – Internet Explorer, Media Player, Pocket Word, Pocket Excel and Pocket Streets to name but a few. Hi-Grade has also included a bonus CD with a ton of shareware programs on it to help you appreciate the power of your new device.

Ultimately, we can't help escaping the feeling that this Pocket PC nearly works, but not quite. In its favour, it is the cheapest model around, and it has just enough processing power and memory to cope with the convoluted OS. The fact that it is just a bit too bulky for us, plus the serial connection and the couple of irritating software glitches, pulls it down a star. Nevertheless, the Hi-Pad would be a good way for someone on a budget to experience the richness of Pocket PCs.

JASON JENKINS

DETAILS
★★★★

PRICE £399 (£339.57 ex VAT)
CONTACT Hi-Grade 020 8532 6111
www.higrade.com
PROS Cheapest Pocket PC; Type II Compact Flash slot; lots of shareware programs; rechargeable backup battery
CONS A little too bulky; a couple of minor issues with software
OVERALL A good budget Pocket PC, with some unique selling points

Nokia 6210

Small and perfectly formed the latest Nokia WAP phone even promises a fast Internet connection

If you fall into the bracket affectionately known by phone manufacturers as the mobile professional – in other words if you need to use your phone for more than social chitchat – then you'll probably want a phone that's small, easy to use and can access the Internet at high speeds. Nokia's offerings in this market have started to look a little long in the tooth, but with the 6210, the company is well and truly back on top.

The first thing that struck us was just how compact the phone is. Key to this is the integrated antenna, which makes a huge difference – apart from making the whole unit a lot sleeker – it makes it easier to keep in your pocket without having to put up with a fat aerial sticking into your side.

We would have liked the phone to be a little smaller, but it is already very thin at only 18.8mm, and with a length of 129mm it is longer than, for example, Sony's CMD-Z5. However, any smaller and the buttons can become a bit tricky to press. It is certainly a very light unit considering its size, weighing in at 114g.

The display is excellent – it's a high-resolution backlit affair, capable of displaying 96 x 60pixels. The backlight is as good as any other Nokia phone's, and can be turned off if you don't want the associated battery hit.

There's a large memory, which has space for 500 names in addition to the capacity of your operator's SIM card. There's also room for up to 150 text messages and 220 calendar notes. The 6210 supports voice dialling with space for 10 voice tags to be associated with numbers entered into the address book.

The 6210 is a dual-band GSM phone, which means it has the potential to work anywhere in the world with the exception of the US and Japan. Our review model included Nokia's Ultra Slim battery, with a quoted talk time of between two and a half and four and a half hours, and a standby time of between 55 and 260 hours.

What makes the 6210 really interesting, and currently unique, is that it is the only phone to support High Speed Circuit Switched Data (HSCSD). Nokia has a PC Card Phone that supports this (see our review on page 107), but with the 6210 you can access this service using one unit. In the UK you can only take advantage of this service if you are with Orange, but if you are, you have the potential to access the Internet at up to 28.8Kbits/sec. This can be done through the phone's IrDA port or

through an optional data cable. We tested the wireless capability of the 6210 using the IrDA port, and found it to be impressive.

The bundled CD makes the whole process very user-friendly and, providing you remember to select high-speed data by moving a slider found in the Nokia control panel, you can be downloading files at a rate of knots in no time. However, there are a few problems with this. High speed coupled with an infra-red connection really hammers the battery, so you'll need to have the 6210 connected to the mains if you're going to be online for a considerable period of time. The second problem is with the service: HSCSD performance varies with location and you're not guaranteed 28.8Kbits/sec. However, it is still a leap forward in mobile telephony.

Another handy utility on the bundled CD-ROM is Nokia's PC Suite. This lets you synchronise calendar entries and names with compatible programs, giving it some limited PDA functionality. This is, once again, done via either infra-red or the optional data cable. You can also compose your own ring tones – something that produced some quite hideous noises in the *PCW* office – and design your own graphics for caller group IDs and picture messages.

There's also a WAP 1.1 browser that, for our money, is still the most intuitive around. The menu system is identical to that found on Nokia's 7110 and, once you have everything set up, is very straightforward to use. We miss the inspired jog dial on the 7110, though, as this still seems to us to be the most logical way to navigate WAP pages.

We wouldn't be surprised to see this phone become the new standard for professionals. It has almost everything – good looks, an integrated antenna, intuitive software, infra-red, WAP, a decent battery and support for HSCSD. The one feature it lacks is POP3 support: this is a shame certainly, but it isn't enough to bring this product down.

Nokia has done such a great job in the design of this phone that we find it hard to fault. As we went to press it was being listed at £129.99 inc VAT with a contract, and we think that makes it a great buy.

JASON JENKINS

DETAILS
★★★★★

PRICE £129.99 (£110.63 ex VAT)
CONTACT Nokia 0990 003 110
www.nokia.com
PROS Integrated antenna; easy to use; HSCSD; WAP
CONS No POP3 support
OVERALL A fantastic mobile for those who need to access the Internet on the move. If you're with Orange you can take advantage of the HSCSD to reduce download times, although you might have to wait for the Orange-branded version

RECOMMENDED
PERSONAL COMPUTER WORLD

PDA phone head-to-head

With the support of Charlie's Angels can the Nokia 9110i beat Ericsson's Symbian-backed R380?

When *Charlie's Angels* hits the big screen later this year the girls will go into battle armed with the latest version of the Nokia Communicator, the 9110i. Is it the most up-to-date technology or should Natalie, Dylan and Alex have asked Bosley to get them some Ericsson R380s?

In some ways it's a bit of an unfair fight. The 9110i is the two-year-old Nokia 9110 with the addition of a WAP browser. And the 9110 was just a facelifted and lightened version of the Nokia 9000. Providence might count when buying a painting or racing car, but in the high-tech world fortune favours the new. The Ericsson R380 has only recently appeared in the shops but it's hardly a spring chicken. The device was first shown off in March 1998 and was expected to ship late that year. But then phones being a year late isn't that unusual. What makes the R380 special is that it's the first true Symbian device. This alliance was created by Psion, Nokia, Ericsson and Motorola, and it counts Philips, Sony and Matsushita as licensees. Even electronics giants like Sony and Philips are small beer next to the Symbian owners. Nokia, Ericsson and Motorola make 80 per cent of the GSM phones in use, the other 10 manufacturers share the remaining 20 per cent. Symbian is the way forward for mobile phones. So, if nothing else this makes the R380 hugely significant.

Head to head with the Nokia 9110i, the Ericsson is smaller and lighter. The Nokia weighs in at 253g, and the Ericsson at 160g. That's still twice the weight of the newest mobile phones, but there is something important about being less than 200g. This is pretty much the point where you feel that you can have it as your only phone. A Psion Revo weighs in at just under 200g.

Both look like normal phones on the outside. The Nokia has a separate screen and number pad, whereas the Ericsson has a flap that covers part of the main screen. The keys on this flap don't actually have an electrical connection but press onto the touchscreen to dial.

The Nokia is bigger in every sense. It's 158mm tall, 56mm wide and 27mm deep, compared to the Ericsson's 128 x 50 x 26mm. That may not seem like much, but creates an impression that the Nokia is not pocket friendly, while the Ericsson is. The dimensions pay off inside though. The Nokia has a 640 x 200pixel screen to the Ericsson's 310 x 100, which is big for a mobile phone but tiny for a PDA.

When it comes to data input it often comes down to a matter of taste and what you use the device for. There are millions of Palm owners who are happy with handwriting recognition and a huge number of Psion users that wouldn't sacrifice a keyboard. The Ericsson and Nokia show that, done badly, neither is a particularly good solution. This comes down to size. Western hands are typically glove size seven (which means seven inches circumference around the knuckles). In fairness, if you want something less than 60mm wide it's always going to suffer in terms of usability, but the Nokia 9110i's keyboard isn't up to anything like rapid typing. It's not just the key pitch but the lack of travel and the feel of the keys that hampers this. We did not like the handwriting recognition on the Ericsson, but it may improve with practice, and it is easier to use than the pop-up software keyboard. This severely cuts down the amount of screen space you have for viewing information. The toothpick-like stylus is housed in the battery on the back.

All new phones are dual band. The Ericsson works at 900MHz and 1,800MHz, which translates to all UK networks and the vast majority of places in the world, with the exception of Japan and the US.

The Nokia isn't really a new phone and consequently is 900MHz only, giving similar global coverage (unless you want to go to Thailand which is 1,800MHz only) but it will only work on BT Cellnet and Vodafone in the UK. This is a shame because Orange is the only network that supports the 14,400bits/sec data rate. The Nokia can do 14,400bits/sec, but as it does not work on Orange's network this ability is wasted in the UK. Conversely, the Ericsson will work on Orange but does not support 14,400bits/sec.

Both are fully specified GSM phones, which means you get call divert, Calling Line Identification (CLI) and text

messaging. Adding a large screen makes for a much better way to track phone calls. Both devices give a good call history and can import contacts from Outlook, in theory at least. We managed to lose company names from our contacts database when we tried, but we suspect some concerted fiddling with settings would solve this. Each contact entry has space for notes and an email address. The R380 makes it very easy to mail people and doesn't offer the option if there is no valid address. CLI brings up the contact's details on the Nokia when they call.

Both devices have extensive call logs, which is great if you can't remember who called you when, or you are poor at noting down people's numbers. As you would expect both the Nokia and the Ericsson have a good choice of ring tones, but the Nokia is the best device available for phone melodies. There is a recent trend towards devices that can record your own ring tone: the Nokia 9110 was doing it two years ago. Ring tones that can be played on any other Nokia phone can be sent by SMS or infra-red. The Nokia supports fax, the Ericsson does not, but in business email is ousting fax as a technology and both the Nokia and Ericsson have POP3 email support. This is no more difficult to configure than most email clients. However, you do need to be aware of the difference between logging on at 9,600bits/sec and whatever you are used to. Spam starts to cost real money, especially if you are roamed and paying £1 a minute for online time. The R380 can show your appointments by week, month or day, but not the week ahead. The small screen makes it all a bit cramped.

WAP is designed for mobile phones, so we would have thought that a bigger screen would not add much. We were wrong. WAP isn't just a different XML, it's a protocol that tokenises data to get more out of it. You lose frames, colour and animation, but gain speed. This is hugely significant. If you want to see what WAP looks like on an Ericsson R380, go to www.gelon.net from a PC where there is an emulator. Of course being on a PC it looks as though you are

watching the Internet through a keyhole, but compared to a mobile phone the eight-line, 54-character screen is a panoramic view. You can suddenly read whole news stories without scrolling.

The touchscreen makes navigating from page to page far easier than on normal mobile phones, and the pop-up keyboard makes entering URLs a lot easier than it is on a phone.

The biggest problem with the R380 is that it's a closed system. There are some third-party applications, but these are accessed through WAP. There is no Software Developers' Kit for the R380, and no mechanism for installing programs.

We understand later phones will reverse this – and guess that there will be

an R520 with GPRS (an always-on Internet connection) and Bluetooth (wireless LAN) but then as this phone is a year late, it might be unwise to wait for the next one.

The Nokia 9110i on the other hand is an open system. It uses Geoworks – a deal done before Symbian existed – and both Geoworks and Nokia have worked hard to promote development. Most of what is available is aimed at narrow vertical markets but there is some software available.

Ericsson claims a four and a half hour talk time for the R380, while Nokia claims the 9110i is capable of up to six hours. In practice it's a matter of what you do. Even though the Nokia has a web browser, if you want to do any heavyweight surfing you'll probably use either phone as an infra-red modem to a laptop. For most people the Ericsson will win by 90g and newer software. But for *Charlie's Angels* the Nokia was the right choice. A 250g phone with sharp corners is much better for hitting someone with.

SIMON ROCKMAN

DETAILS
★★★

NOKIA 9110I
PRICE £249.99 (£212.50 ex VAT)
CONTACT Nokia 0990 003 110
www.nokia.com
PROS Full mobile connectivity; WAP; email and HTML
CONS Dated; heavy; expensive
OVERALL Despite being two years old the 9110i still has a lead in this market. One day all PDAs will do what this does, but they will weigh less

★★★★

ERICSSON R380
PRICE £299.99 (£254.15 ex VAT)
CONTACT Ericsson 0990 237 237
www.ericsson.com
PROS The first Symbian machine; good browser speed; very light for what it does
CONS Handwriting recognition poor; still twice the weight of a new mobile phone
OVERALL The best option for anyone who wants a combined PDA and phone. Good performance

VideoLogic Vivid!

VideoLogic's attempt at recapturing the budget market is an ideal graphics card for 32bit gamers

With the release of the new Vivid! card, VideoLogic hopes to recapture the budget market and, based on the evidence we've seen, it might just succeed. VideoLogic uses PowerVR chips – the second-generation version is in Sega's Dreamcast. This card features series three, known as the Kyro.

The secret to the chip's success is tile-based rendering – in layman's terms the Kyro does not bother rendering anything you can't see. VideoLogic claims this removes the need to use the fastest, most expensive memory, and to an extent our performance results bear this claim out.

The card also supports environment bump mapping and eight-layer multi-texturing for extra detail. However, there's no Transform and Lighting

(T&L) support due to the extra cost.

There's 32MB of SDR SGRAM on the card, clocked at the same speed as the chip, 115MHz. This may not sound impressive but it seems to do the job. The Vivid! is a direct competitor to nVidia's own GeForce2 MX cards and, compared to the Asus V7100 (a card based on the MX chip) we reviewed in our November issue, the Vivid! fares very well. At both 1,024 x 768 and 1,280 x 1,024, the MX-based card had the edge when it came to 16bit colour. Turn on 32bit colour, though, and the Vivid! runs away with the prize for the fastest card, only dropping a few frames per second on its 16bit colour score. Given the choice, we would much prefer to play a game in

32bit colour, and on that basis we're giving Vivid! a recommended award.

JASON JENKINS
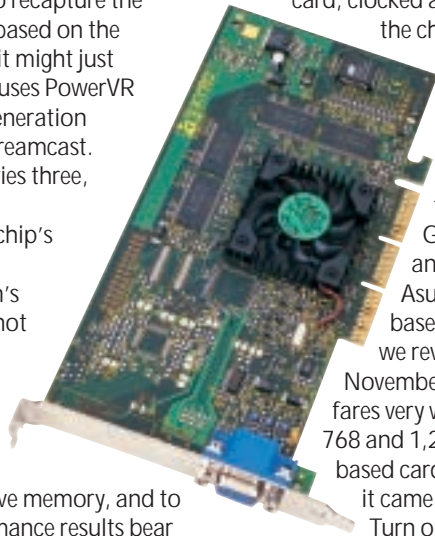
DETAILS
★★★★★

PRICE £116.33 (£99 ex VAT)
CONTACT VideoLogic 01923 277 488
www.videologic.com
PROS Low cost; faster than the competition in 32bit colour
CONS No T&L support; not as fast in 16bit
OVERALL A good compromise between speed, features and price. If you play at 1,024 x 768 in 32bit colour, this is a good option

PERFORMANCE RESULTS

0	1,000	2,000	3,000	4,000	5,000

2,241
3DMark 2000 1,280 x 1,024 32bit

0	15	30	45	60 (fps)

32.8
Quake III 1,280 x 1,024 32bit
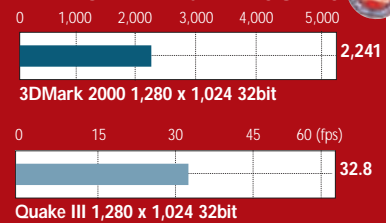
VoodooMac 5500 PCI

3dfx attempts to work its magic in order to challenge ATi Radeons in the Macintosh market

While the conflict continues in the PC graphics wars, things are pretty quiet on Macintosh front. Thanks to a deal with Apple to supply the standard cards in its machines, ATi practically has the market to itself. However, things could be set to change as 3dfx attempts to work in its magic with the VoodooMac 5500 PCI.

The 5500 boasts 64MB of SDRAM and two of 3dfx's VSA-100 processors running at 166MHz. These chips work in parallel using a system known as SLI (scan line interleave), which splits the display between the processors for faster performance.

As well as fast 3D graphics the Voodoo is the first card to bring full scene anti-aliasing (FSAA) to the Mac. This eliminates unsightly jagged lines on screen, and the 5500 features both 2x and 4x over-sampling. 3dfx claims FSAA will work with any Mac 3D title.

FSAA is just one of the features offered by 3dfx's latest T-buffer

technology. Other offshoots include the ability to create motion blur, depth of field focus, soft shadows and soft reflections. The 5500 supports all major Apple 3D APIs, features Quick-Draw and QuickTime acceleration, and is the first Voodoo board to give 32bit colour. The card offers a maximum 2D resolution of 2,048 x 1,536 and 1,600 x 1,200 in 3D.
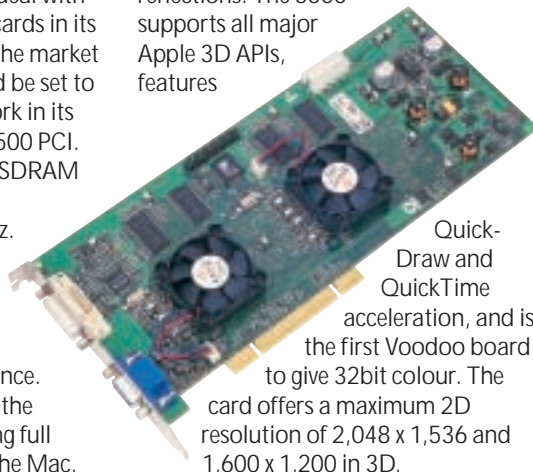
In tests on our G4 with Unreal Tournament, the improvements using FSAA could be clearly seen, providing much smoother images. There is a drop in the average frame rate using the 4x option, but at 800 x 600 the game was

playable with an image quality normally associated with higher resolutions.

Quake III saw less improvement and frame rates plummeted to practically unplayable levels with FSAA turned on. We didn't see a huge leap over Voodoo 3 cards here – you can run these older PC cards on the Mac using unsupported beta drivers from the 3dfx website.

CHRIS CAIN

DETAILS
★★★★

PRICE £269 (£228.93 ex VAT)
CONTACT 3dfx 01753 502 800
www.3dfx.com
PROS Good image quality; faster than ATi Rage 128 Pro cards; PCI bus suits a wide range of Macs
CONS AGP version not yet released; doesn't support Apple DVD player
OVERALL If you're after the best in 3D image quality in the Mac market, this is it. However, it faces competition from ATi's Radeon

Kodak DC5000

An all-weather camera that will suit photographers who are not afraid to get their hands dirty

While most of us can ensure the relative safety of our electrical gadgets, there are those who need them to perform confidently under tougher-than-average conditions. Construction workers, emergency services, insurance adjusters and even outdoor enthusiasts regularly find themselves in dusty, dirty or wet environments and need to know that their equipment can keep up.

These are the conditions you would be a fool to take a digital camera into – unless it was Kodak's new DC5000, the first rugged weatherproof digital camera we've tested. Note the term weatherproof. The DC5000 is not waterproof, nor designed to be submerged or have water poured over it. It is, however, fairly resistant to rain and excessive dirt or dust, meeting the IEC 529 Class 4/IP 54 standard.

From the outside, the DC5000 is certainly chunky. Measuring 140 x 89 x 83mm and weighing 459g – without batteries – it's actually quite a monster compared to the current raft of increasingly waif-like digital models. It does, however, feel reassuringly solid and capable of taking on some rough treatment. Like other sports equipment, there's also something quite satisfying about the rubber exterior, dust-proof seals and over-sized controls you can handle while gloved-up.

One such sealed door on the side opens to reveal the power, TV video output and serial/USB connectors, along with a Type I Compact Flash slot (sadly not capable of taking the IBM Microdrive, but then would it really like being knocked around by the DC5000's target techno-ruffians?). Underneath, another door opens to accept four AA batteries. Kodak supplies a set of alkalines, but it's up to you to buy some rechargeables and a recharger.

On the inside, the DC5000 is a remarkably familiar camera – it is in fact essentially a Kodak DC280, rubbered-up for a bit of rough trade. Now, although

the DC280 was a pretty good camera when it first came out, the digital goalposts have been moved considerably. Fortunately for Kodak, the DC280 was slightly ahead of the game on first release, so its specs just about compare with today's competition.

The DC5000 is a 2.1megapixel camera, but unlike the 1,800 x 1,200 resolution of

The Kodak DC5000 is essentially the DC280 with a rubber exterior

other 2.1 models, Kodak uses a CCD that delivers 1,760 x 1,168 pixels. An additional 896 x 592 pixel mode is offered, as are three levels of jpeg compression – there is no uncompressed tiff mode.

At the best-quality resolution and jpeg setting, the DC5000 delivers typical image files between 590 and 980KB, which results in around 10 pictures on the supplied 8MB memory card.

Rather disappointingly, the optical zoom lens is only 2x, equivalent to a 30-60mm focal length on a 35mm film camera; the actual specification is 6.5-13mm, f 3~3.8. The closest macro focusing distance is a distant 25cm.

The DC5000 is pretty much an automatic affair with no manual control over its two aperture settings or the shutter speeds between 1/2 and 1/755 seconds. You can, however, adjust the

exposure compensation from +/-2EV in half EV steps and choose between multi-pattern or centre-weighted metering. The flash can be forced on or off, left to auto or set for red-eye reduction.

All in all, it's an easy camera to use. The menus are intuitive, and it's possible to directly adjust the flash, macro and self-timer modes from three buttons on the top alongside a clear LCD panel.

The supplied software is also good, including a utility to remotely configure and control the camera from your PC.

At the end of the day though, the DC5000 is nothing more than a weatherproof DC280 which, despite delivering good-quality pictures, is definitely showing its age. On the other hand, what other options are there for rugged-style environments?

If you're a consumer worried about a little splashing, you could go for the far more desirable Canon Digital Ixus or Sony DSC-P1 and invest in their (admittedly expensive) optional marine housings. These are unlikely, however, to cut the mustard for the kind of folk mentioned at the beginning of this review, for whom the DC5000 represents a welcome and reasonably priced introduction to digital photography.

GORDON LAING

DETAILS
★★★

PRICE £529.99 (£451.06 ex VAT)
CONTACT Kodak: 0870 243 0270
www.kodak.com
PROS First truly weatherproof, rugged digital camera
CONS It's actually an aging Kodak DC280 underneath
OVERALL A good choice for regularly dusty, dirty or rainy environments, but for the occasional splash, consider a newer camera with a marine housing

Fujifilm FinePix 40i

For those who want music with their pictures Fujifilm's latest offering doubles as an MP3 player

The FinePix 40i is Fujifilm's latest digital camera to house its proprietary Super CCD imaging chip. First seen in the FinePix 4700Zoom, the Super CCD has courted a little controversy in terms of description and performance, but more of that later. The thing that makes the new FinePix 40i really special is that this tiny camera is also an MP3 player.

Fujifilm has made the necessary modifications, fitting the 40i with a connector for the supplied remote control and earphones – the latter are detachable in favour of your own if you prefer. The USB driver simply mounts the 40i's memory card as a drive in Windows, but while you can happily drag image files out, you can't just copy MP3s across and expect to listen to them.

In an attempt to control piracy, Fujifilm forces you to use a supplied Audio Downloader utility, which further encrypts MP3s by adding an SVQ header before transferring them into the camera for playback. This adds copy protection to the files. Sound quality is not affected, although the 40i will only handle the lower MP3 rates of 96, 112 and 128Kbits/sec. In audio mode the remote controls everything, although sadly its display doesn't indicate track time.

All neat stuff, but how does the FinePix 40i fare as a camera? It's certainly pocket sized at just 86 x 71 x 29mm, which makes it the same width and thickness as Canon's Digital Ixus, but about 14mm taller. It is lighter though, weighing only 210g with batteries. Speaking of which, the 40i is powered by a pair of 1,600mAh NiMH AAs (supplied with charger), good for taking around 80 shots with the 1.8in LCD or 230 with the optical viewfinder alone. A fresh charge should alternatively provide 150 minutes of music playback. Frustratingly, you're only alerted to battery life when it's almost all gone.

Sadly, the only zoom is a digital one, with the 40i's lens fixed at 8.3mm, equivalent in coverage to a 36mm lens on a 35mm camera; it can focus as close as 6cm. Exposures are pretty much automatic, with the camera choosing from either f2.8 and f9.8, and a range of shutter speeds between a quarter and a thousandth of a second. Exposure compensation is offered between +/-1.5EV in one-third EV steps and the flash can be forced on, off, set for red-eye reduction or slow-synchro.

There's a movie mode that can capture 320 x 240 video at 10fps with audio, at a rate of around 45 seconds per 8MB: clips can be up to 80 seconds each, memory permitting. The avi files can be
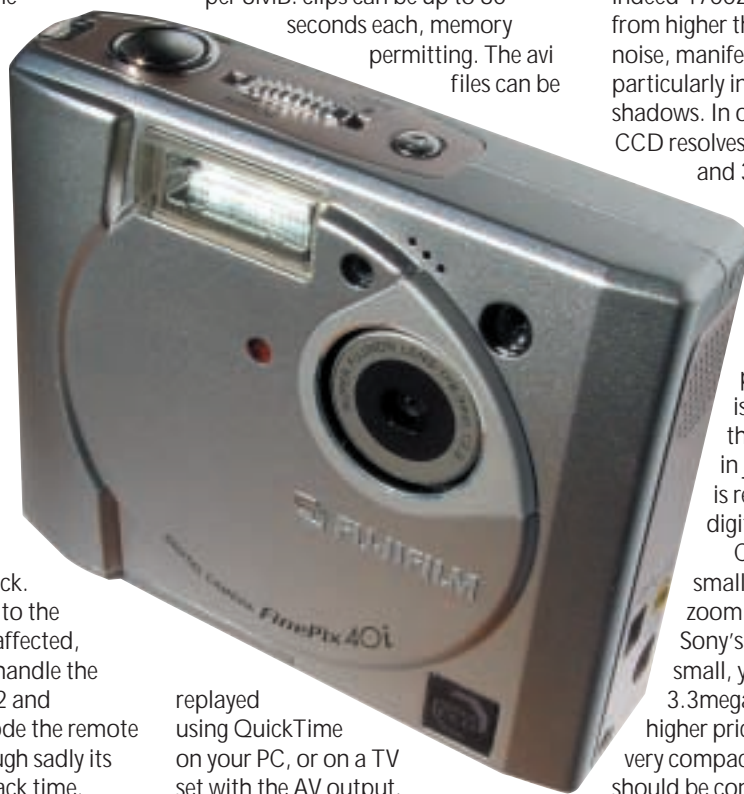
replayed using QuickTime on your PC, or on a TV set with the AV output. Unfortunately, the video clips only fill half the TV or LCD screen, and aren't as smooth as the 15fps on many 3.3megapixel cameras.

Fujifilm again has remained faithful to the wafer-thin SmartMedia memory format, and supplies the 40i with a measly 8MB card. Highest resolution 2,400 x 1,800 pixel files can be saved at three levels of jpeg compression, resulting in four, nine or 23 pictures per 8MB; lower resolution 1,280 x 960 and 640 x 480 pixel files are also offered. Ultimately, you'll want more memory for MP3 playback, with 8MB only good for a couple of short tracks; the 40i can accept SmartMedia cards up to 64MB, which cost around £140 each.

At the business end of things lies one of Fujifilm's 2.4megapixel Super CCDs, which it claims is equivalent to a 4.3megapixel conventional CCD. While cameras using this Super CCD certainly output 4.3megapixel 2,400 x 1,800 images, the fact remains they started with just 2.4megapixels. Not only that, but raw 4.3megapixel files measure around 12MB, which means Fujifilm has to turn the compression up quite high to deliver the 1,700KB jpegs on the 40i's best-quality mode.

In our tests, most of the 40i's (and indeed 4700Zoom's) images suffered from higher than average electronic noise, manifesting itself as speckling, particularly in smooth graduations and shadows. In our optical tests, this Super CCD resolves somewhere between a 2.1 and 3.3megapixel model, which ties in with its 2.4megapixel origins.

At the end of the day though, the 40i is a snappy camera and its pictures are fine for this purpose. The lack of zoom is disappointing, but allows the 40i to power up or down in just over a second, which is record-breaking for a digital camera.

Canon's Digital Ixus is smaller and features a 2x zoom, but is only 2.1megapixel. Sony's forthcoming P1 is also small, yet boasts 3x zoom and 3.3megapixels, albeit at a slightly higher price point. If you're after a very compact digital snapper, all three should be considered, but only one can double as a personal stereo – a novelty that could swing it for you.

GORDON LAING

DETAILS
★★★★

PRICE £549 (£467.24 EX VAT)
CONTACT Fujifilm 020 7586 1477
www.fujifilm.co.uk/di
PROS Small; light; very quick startup and shutdown; can play MP3 audio
CONS No optical zoom; needs more memory for music; electronic noise in shadows
OVERALL A cute, versatile and reasonably priced compact digital snapper, but potential buyers should also consider Canon's Digital Ixus and Sony's DSC-P1

Psion Wavefinder

A futuristic, chic and beautifully designed digital radio that can pass data to your PC

Psion has given its Wavefinder digital radio a sleek futuristic look, in chic see-through coloured plastic, to appeal to trendies willing to pay a premium for elegant novelties. This is not to say the device is expensive at almost £300 – until very recently you could pay £2,000 or more for a Digital Audio Broadcast (DAB) receiver. But it is competing in a market in which you can buy a perfectly usable analogue radio for a tenner and a high-class FM tuner for less than £100. So why pay more?

The position is similar to that of digital TV. Virtually all broadcasting is shifting to digital, which allows more channels for any given bandwidth and can provide better quality. If you buy early, you pay more because there is less chip integration and there are fewer economies of scale.

But vendors are starting to subsidise digital radio to kickstart the market. VideoLogic, for example, has written off its R&D budget to offer as a standalone model the DRX-601E for around £300.

Psion's Wavefinder differs in that it passes data to a PC, allowing it to use DAB's ability to carry different types of data. TV signals have the same potential but companies have been conservative in using them (older Teletext-type services are generally used passively, though some systems can strip out data for computer use).

DAB could become the first mass technology fully to exploit broadcast multimedia data. DAB broadcasters, which includes the BBC and just about all major independent radio stations, are eager to explore its potential. Non-audio components of today's signals are rudimentary but they have yet to be let loose on computers.

Which is why the Wavefinder is so interesting. Installation is simple, if you read the instructions. If you don't take the time to do this you could end up putting the power plug into the Wavefinder's unmarked auxiliary aerial socket, where it actually fits quite snugly, and then

wondering why the damn thing won't work – you can guess who did just that.

System requirements (see box) are relatively high because, to facilitate upgrades and future proofing, much of the processing is done on the PC.

An 'eye' on the front of the Wavefinder glows red, blue or a satisfying green depending on signal strength. A mini signal-strength meter on a tiny desktop control panel allows you to optimise the position of the aerial, which is designed to be fixed onto a wall.

The software is disappointing. It avoids the easy option of using a familiar radio dial: instead you get a scrollable collection of station icons grouped into 'multiplexes'. There is no way to get them all on screen at once, even though there is room. You can, however, choose to display only a selection of your favourites. You will get different icons in different geographical areas: Wavefinder scans the airwaves to see which stations are available. More on-screen information about the various stations would be welcome, though one BBC icon pulls an electronic programme guide from the airwaves.

Common to all the stations is a little tickertape with information about what is being played; Wavefinder, with the whole PC screen to play with, lets you see this as a static caption. In theory this text can include hot links but we never got one to work; there is no reason they shouldn't, though, so there is much potential for advertising and commerce.

The music industry is already eyeing this as a way to sell tracks from airplays; it may view with rather less pleasure the fact that Wavefinder can also record a track, in MP3 or MP2 format, at the click of a button at what is described as 'near-CD quality'.

There is no way to schedule

recordings, potentially a big advantage of smart radio. But, as long-time PC users know, a compensation of being the first to use inadequate early software is that you can feel part of its development. Designers have yet to figure out how we are going to interface with the bewildering array of multimedia data streams that will soon be at our fingertips, and we have to start somewhere.

In fact you can get your own hand in – there is already a Tools section on the www.wavefinder.com site. If DAB gets even a fraction the software development effort that has gone into WAP it could be very big indeed.

Wavefinder is part of a multi-faceted evolution. DAB is designed for mobiles: a major reason for its development was to improve car radio reception. Psion says a portable version of Wavefinder will be available as soon as next year, to be followed by one with cellphone capability.

This will transform the kind of services currently struggling with WAP. Move into an area and the local radio station could carousel you all basic local information, including maps, plus an interface providing quick access to updates on the likes of traffic conditions. It could even pump out your morning newspaper. Stick all that into your car radio or Psion organiser and see what you get.

See also news pages 27 and 48.

CLIVE AKASS

DETAILS
★★★★★

RECOMMENDED
COMPUTER
WORLD

PRICE £299 (£254.47 ex VAT)
CONTACT Psion 01908 269 228
www.psion.com/infomedia
SYSTEM REQUIREMENTS USB; minimum 333MHz Pentium or equivalent, Windows 98 with 64MB of RAM; Windows 2000 and ME with 128MB
PROS Beautifully designed hardware
CONS Software a little ragged
OVERALL OK, so the five-star score is for being different. The Wavefinder has its snags but this is a groundbreaking design that will surely become a collector's piece. It's a great DAB test bed with quality sound, if you can ignore those noisy PC fans

Philips 19in monitor

Philips' 109B20 monitor uses innovative LightFrame software to brighten up your desktop

The 19in 109B20 is one of the latest monitors that uses Philips' patented LightFrame feature. This software only works with Philips' specially equipped monitors and allows the user to selectively raise the brightness and contrast of an open window or area of the desktop. The idea behind this is to duplicate the way a television uses an extremely high beam current to produce vivid images. On a high-resolution monitor a high beam current would lead to blooming. Indeed if LightFrame is used to highlight text, blooming and streaking are obvious. However, applying it to an image or DVD movie gives results akin to a television.

The CRT comes housed in a space-saving chassis with a narrow back and flanks that curve downwards and to the front of the unit. The bezel is narrow too, enhancing the size of the display. Around the back, all you'll find is a captive D-SUB cable. On the front is the familiar set of on-screen display (OSD) buttons comprising four arrow keys and an 'OK' button. Access to the settings is efficient thanks to the intuitive OSD menu system and informative prompts. All the usual settings for screen position and geometry are available but colour convergence controls are absent – a shame as horizontal colour registration was a little out on our test unit. This aside, there are settings for moiré, zoom, and a choice of five languages.

The shadow-mask tube possesses an 18in viewable diagonal and a dot pitch of 0.25mm. The maximum resolution is quoted at 1,920 x 1,440 at 60MHz, but most will find 1,280 x 1,024 at a flicker-free refresh of 91MHz more suitable. Overall image quality is good, with impressive colour purity and vertical resolution. Text is in focus across most of the screen, but is affected by a slight colour mis-convergence along the bottom. As for geometry and power regulation, they are difficult to fault.

JALAL WERFALLI

DETAILS
★★★★

PRICE £370.12 (£315 ex VAT)
CONTACT Philips 01756 702 892
www.pcstuff.philips.com
PROS Space-saving design; innovative LightFrame technology; vivid colour
CONS No BNC connectors and captive D-SUB; lack of convergence controls
OVERALL A good all-round package at a reasonable price for a 19in monitor. LightFrame will attract some users, but may have limited universal appeal

Matsucom onHand PC

If you've become attached to your PDA, Matsucom has a 'geek-chic' PDA that attaches to you

The onHand PC, is a close relation of the Seiko Ruputer, which is only sold in Japan. The onHand PC may be new in this country but the idea isn't new – remember the Timex DataLink? If you thought that was geeky, wait until you see the onHand PC – strap this on and you'll be able to out-geek anybody on your block! This watch actually has a screen just about big enough to call it a computer.

This new wrist-computer includes a 3.6MHz, 16bit CPU with 128KB of SRAM and 2MB of Flash memory, roughly the same firepower as an original Palm Pilot. The five-line, 20-character screen is fairly readable and the dim EL backlight certainly improves legibility. You even get a pointing device in the shape of a tiny joystick that's surprisingly easy to use when it comes to navigating the onHand PC's functions. However,

entering data with the joystick isn't easy. Luckily, you can link it up with your desktop PC by placing it into the included docking port – it hooks via a nine-pin serial lead. It even has an IrDA-compatible port for 'beaming' to other onHand PCs.

This is a PDA, so you'll find a calendar and scheduling program, an address book, a notepad, an expense keeper, four little games and a program that lets you view black-and-white images – but quite why you would want to view your images in monochrome on a 102 x 64pixel

screen beats us. The included software lets you either type in data on your PC's keyboard or sync it to the PIM applications you already use, such as Microsoft Outlook, Lotus Organizer, or even Palm Desktop. However, the syncing software needs a little work as we had trouble getting it to sync with our Outlook 2000 contacts.

ROGER GANN

DETAILS
★★★

PRICE £200 (£170.20 ex VAT)
CONTACT Matsucom 020 8657 1172
www.onhandpc.com
PROS All the features of a PDA packed into a watch. You'll never lose your PDA again
CONS Unwieldy; unfinished desktop software. Not what we'd call a 'looker'
OVERALL The ultimate in geek chic, it would suit someone who needs very simple address book, scheduling and to-do programs and doesn't want a larger handheld device

Motherboard stand-off

The Abit KT7-Raid and Asus A7V go head-to-head in making the most of Socket A processors

Socket A processors have been around for a few months now, and so we thought it was time to take a look at two motherboards that give users the chance to harness the power of these new chips.

Both of these boards are based on the VIA KT133 chipset, which has become the de facto standard for Socket A CPUs. The overall layout of both of these boards is good, although it is slightly harder to fit a fan on the Asus than the Abit due to the positioning of the socket's clip. Both of these boards have the same basic feature set as they are both based on the same chipsets. What's interesting, though, are the extra features that the two manufacturers have added above and beyond the chipset.

Abit has included a HighPoint HPT370 controller for onboard UltraDMA100 EIDE RAID. This allows you to set up your own RAID system without shelling out for expensive SCSI hard disks. The controller supports four configurations: RAID 0, for performance-enhancing striping; RAID 1, mirroring for data security; and 0+1 that combines both modes, although since it requires four drives it becomes a little costly. The fourth mode, spanning, is also known as JBOD (Just a Bunch Of Drives) and is exactly as it sounds: you can use drives of any size and span them together to create one extra large drive. This is not an ideal solution if you are after extra reliability, but it is a great option for those on a tight budget with a few old hard drives they would like to use for storage.

The A7V also boasts UltraDMA100, but since it uses the Promise PDC20265 controller you don't get the bonus of EIDE RAID. This makes the board marginally cheaper and you still get eight EIDE channels. Both Abit and Asus have supplied two EIDE cables with their boards, but Abit has the upper hand here since it has supplied two UltraDMA66-/100 cables instead of Asus' single UltraDMA66/100 and one UltraDMA 33 cable.

Both boards come with the optional USB header in the box. The KT7-RAID has two

*Top: Abit KT7-RAID
Bottom: Asus A7V*

extra connectors, while the A7V has three, and the ability to connect a further two for a total of seven. The A7V can do this as it has an extra onboard USB hub.

The KT7-RAID has another neat feature – a fan on the northbridge. This will be useful for overclockers, as it will help to keep the northbridge cool if you increase the bus speed of the motherboard.

One other difference is that the Abit board has an ISA slot, while the Asus has an AMR slot. The ISA will be more useful for those with legacy cards, but be aware, though, this is a reversed AMR slot and will need specially designed cards such as Asus' own AMR modem.

The A7V has an AGP Pro slot: this is not a new standard for AGP, but was intended for workstation graphics cards that need more power than a normal AGP slot can provide. As such it is unlikely that many people will need it, but it is there if you do.
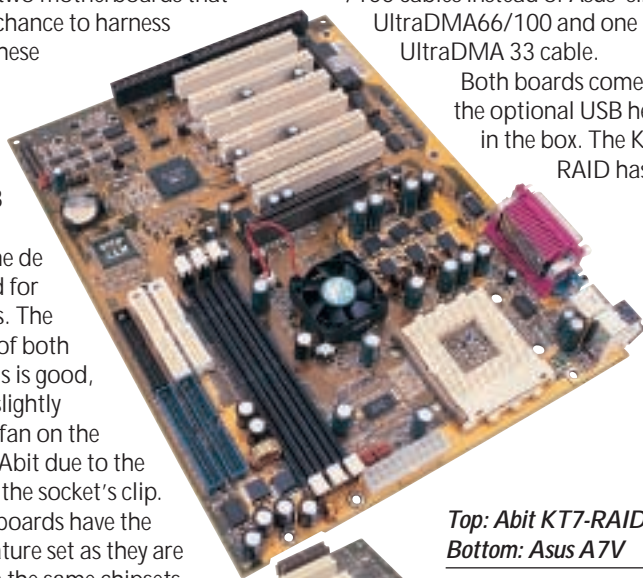
Both boards offer three DIMM slots for a maximum of 1.5GB of RAM. The rest of the specifications are fairly standard, with the usual complement of PS/2, serial, parallel and USB ports at the rear, together with five dedicated PCI slots. The KT7-RAID has an extra PCI slot if you don't want to use the ISA slot.

Both boards were easy to set up; both can boast a well-written BIOS to appeal to the novice and more advanced user alike. Both Abit and Asus have produced excellent manuals that cover how to set up the BIOS, installing drivers and so on. No documentation can quite live up to AOpen's, though.
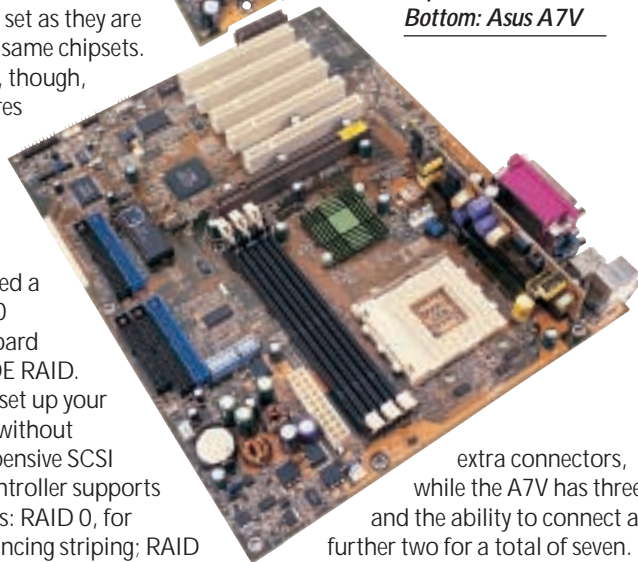
When it comes to the driver CDs, Asus has the upper hand since it has supplied a few more software titles, like PowerDVD and Yamaha DB-50XG software MIDI player.

Choosing which of these boards to buy is more a matter of personal preference than anything else. Both are clear five-star products, but for us Abit just pips Asus to the post as, even if you don't need EIDE RAID, it is there nonetheless and there's nothing in it price wise.

LARS-GÖRAN NILSSON

DETAILS

★★★★★

ABIT KT7-RAID
PRICE £137.48 (£117 ex VAT)
CONTACT dabs.com 0800 138 5240
www.abit.nl
PROS EIDE-RAID; easy to set up; software overclocking option
CONS Dosen't have as much software as the Asus
OVERALL A great, feature-rich board for those wishing to build the ultimate AMD system

★★★★★

ASUS A7V
PRICE £139.83 (£119 ex VAT)
CONTACT Panrix 0113 244 4958
www.asus.com.tw
PROS UltraDMA100 on board; easy to set up
CONS We would have preferred a soft-overclocking option
OVERALL A great quality product at the right price, just beaten by Abit

ASK M3 projector

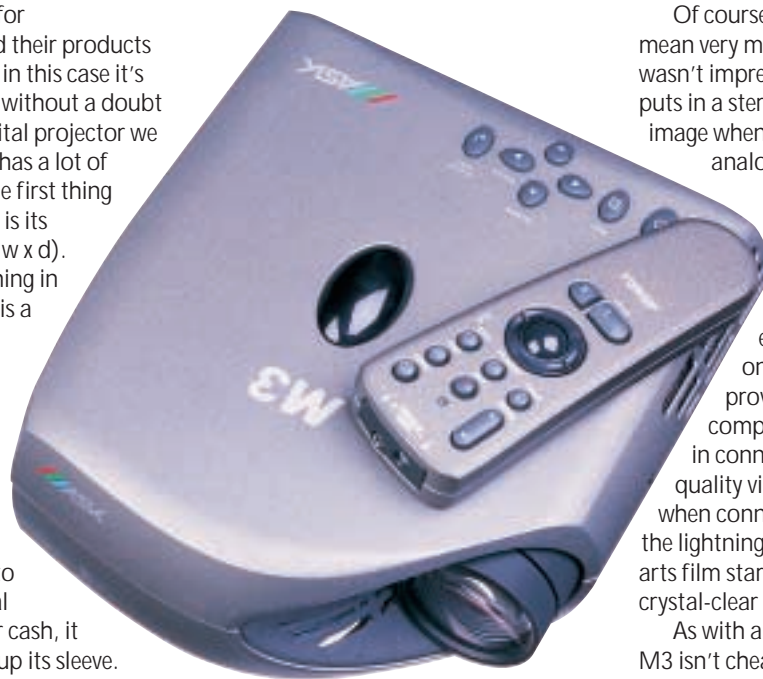## A lightweight product with a large enough selection of features to brighten up any presentation

ASK may not be the first name that springs to mind when you think of projectors, but it's worth bearing in mind that ASK and Proxima are both part of the same company. However, if that doesn't give you an idea of this company's size and market share, you should also be aware that it has recently merged with In-Focus – quite possibly the best-known digital projector manufacturer around.

It's not uncommon for manufacturers to herald their products as groundbreaking, but in this case it's actually true. The M3 is without a doubt the most impressive digital projector we have ever seen. The M3 has a lot of excellent features but the first thing that strikes you about it is its size, 60 x 175 x 210 (h x w x d). It's also very light, weighing in at around 1.7kg, which is a little heavier than the 1.5kg claimed in the documentation. This is the type of projector that mobile presenters have been praying for. Even though the dimensions and weight of this unit are enough to convince many potential buyers to part with their cash, it has a lot of other tricks up its sleeve.

The M3 is a DLP-based projector and produces a very bright 1,000 ANSI lumen image that's easy to read even with fluorescent lights on. Despite its diminutive size, the M3 can throw an image of up to 230in diagonal. It's unlikely that you'll need anything that big from a device like this, but it's good to know that you've got the option. The native resolution is 1,024 x 768, which makes it an ideal companion for the majority of notebooks. At the rear of the projector are only two connectors, one DVI and one USB. The DVI connector will accept both analog and digital signals, and a cable is provided to connect the M3 to both analog D-SUB ports and digital DVI ports.

The USB connector is the key to one of the M3's best features. When a computer is linked to the M3 via USB, all of the projector's features and menus can be activated and manipulated directly from the computer via supplied software. What makes this feature even better is that any settings you apply to the projector via a specific PC will be remembered the next time that computer is attached to the M3. As well as manipulating the projector's menus, the software will allow you to lasso areas of the image on the computer's screen that the projector will then zoom in on. While the projector is zoomed in, the computer's screen will display the whole image with the zoomed area outlined. This outline can then be moved around the image changing the zoomed view on the projector.

A lot of thought has gone into the menus embedded in the M3 and anyone familiar with Windows will have no problem navigating them since they look almost identical to nested Windows menus.

Mounted on the top of the unit is a light sensor that will measure the ambient lighting and adjust the brightness settings on start-up. This is only done when the projector is turned on, so if the lighting changes after that point manual adjustment will be needed.

Another great feature is the standard tripod mount located on the underside of the chassis making it easy to mount the projector either on the ceiling or on a photographic tripod.

Of course all these features wouldn't mean very much if the image quality wasn't impressive, but thankfully the M3 puts in a sterling performance. The image when connected to a PC via analog or digital sources is superb, even in bright lighting conditions. If you want to connect standard AV sources to the M3 you can use the supplied expansion module. This clips onto the rear of the unit and provides inputs for S-Video and composite sources as well as line-in connectors for sound. The image quality via S-Video was also excellent when connected to a DVD player. Even the lightning-fast movements of martial arts film star Jet Li couldn't faze the M3's crystal-clear display.

As with any good DLP projector, the M3 isn't cheap at £4,295 ex VAT. That said, this price includes the projector, the AV module, a staggering amount of assorted cabling and the infra-red remote control. The M3 is also being marketed under the guise of the Proxima Ultralight X350, so if you're having trouble finding it, look for one of these as well.

Ultimately, you either need a projector or you don't, but if you do you'd be hard pushed to find a better solution than the ASK M3.

RIYAD EMERAN

The M3 allows an AV expansion module to clip into the back for inputting video and sound

DETAILS
★★★★★

PRICE £5,046.62 (£4,295 ex VAT)
CONTACT ASK-Proxima 01628 66 662
www.askproxima.com
PROS Small; light; excellent menus; great image; tripod mount
CONS Quite pricey
OVERALL Quite simply the best portable projector you can buy

CD-RW shoot-out

AOpen CRW1232, HP 9510i and Sony CRX160E-RP vie for top marks in our three-way review

With CD-RWs becoming the norm for removable storage, we thought we'd have a look at three of the newest CD writers available: AOpen's CRW1232, Hewlett-Packard's 9510i and Sony's CRX160E-RP. All the drives are EIDE, so installation was fairly simple, as was loading the software. Also, all the drives come bundled with one CD-R and one CD-RW disc.

Out of the three the AOpen CRW1232 has the fastest rewriting speed at 10-speed, although it is still compatible with media designed for slower rewriters. The writing and reading specs are 12-speed and 32-speed respectively. The Data Buffer Memory is 4MB, while the average access time is 120ms or less. AOpen supplies Nero 5 and Nero InCD packet writing software. This allows both novices and advanced users to get the most from the writer. Also included are Norton Ghost and Formosoft Gamut 2000 MP3 Tools.

The Hewlett-Packard 9510i by contrast has HP's own simplified CD creation software. This software is ideal for a beginner, but advanced users may find it too simplified. One of the better aspects of the software is that it allows background formatting of CD-RWs, so you don't need to stop using your PC while formatting. The HP buffer is 4MB like the other drives, but it has a fractionally slower average access time of 125ms. The write, rewrite and read speeds are 12-speed, eight-speed and 32-speed respectively.

The Sony CRX160E-RP is also a 12-speed write, eight-speed rewrite and 32-speed read CD writer. Again it has a 4MB buffer and, as with the AOpen, its average access time is 120ms. The bundled software is a customised version of CeQuadrat WinOnCD 3.7 and Adaptec DirectCD. Unfortunately, we found that when a new CD-RW was inserted it would prompt both of these

Clockwise from left: AOpen CRW1232, HP 9510i and Sony CRX 160E-RP

tools to conflict, as both applications tried to format the disc. This was easily resolved by shutting down one of the applications. Also bundled are PowerQuest Datakeeper and DriveImage.

For comparative results we installed the drives into a reference machine and ran our standard tests, which revealed the following results and performance differences. Formatting a CD-RW showed the Sony to be dragging its feet, something that can't entirely be put down to the CD rewrite speed as the HP is also an eight-speed: the Sony took 47 minutes 20 seconds, where the HP took 26 minutes 17 seconds and the AOpen 19 minutes 56 seconds. Copying one of

our cover CDs (490MB) onto a CD-R revealed a more matched performance, with the Sony taking five minutes 29 seconds compared to five minutes 15 seconds from the AOpen and five minutes 27 from the HP. Copying a video CD (495MB) revealed a second weakness in the Sony, which took seven minutes five seconds while the other drives were comfortably below six minutes. Considering the write speed of all three drives is the same, firmware issues are the likely cause for this. Copying the same discs to CD-RW increased the transfer times by a significant margin with sluggish results of between 17 and 18 minutes for the HP, around 17 and a half minutes for the AOpen, and between 17 and a half and 18 minutes for the Sony. Read tests by comparison were far swifter with all reading various formats in comparable times.

Of the three, the AOpen comes out best, although not by a significant margin. However, if it's simplicity of use you require the HP will probably suit. Having said that, none of these drives could match the performance of Plextor's BURN-Proof 12x10x32 CD-RW we reviewed in September's issue.

SCOTT MONTGOMERY
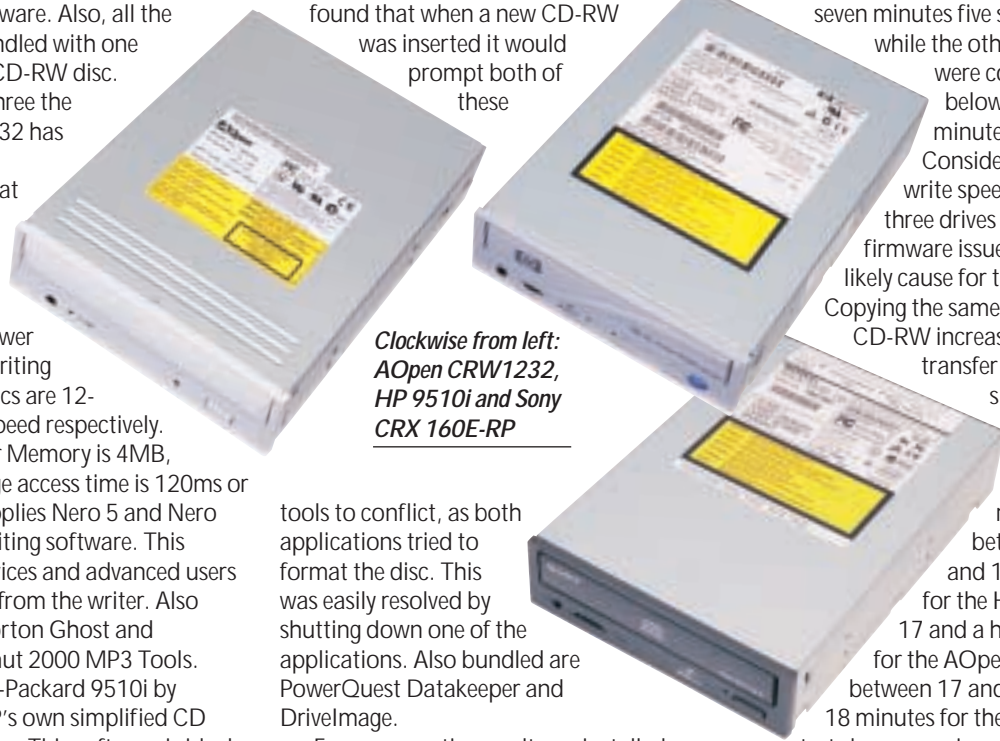
DETAILS
★★★★
AOPEN CRW1232
PRICE £170.38 (£145 ex VAT)
CONTACT dabs.com 0800 674 467
www.dabs.com
PROS Fast CD reading and writing
CONS Relatively slow CD rewriting
OVERALL A good quality drive only let down by poor rewriting performance

DETAILS
★★★★
HEWLETT-PACKARD 9510I
PRICE £202.10 (£172 ex VAT)
CONTACT dabs.com 0800 674 467
www.dabs.com
PROS Simple software for the novice user; background CD-RW formatting
CONS The software won't appeal to the advanced user
OVERALL The ability to format in the background is the major time saver

DETAILS
★★★
SONY CRX 160E-RP
PRICE £210.32 (£179 ex VAT)
CONTACT Sony 01932 816 660
www.sony-cp.com
PROS DriveImage and Datakeeper come bundled
CONS Slowest drive tested here; conflict problems with the software
OVERALL A fair enough drive, but simply not up to the standards of the rest

Lexmark Z42

A fast colour printer that offers a top resolution of 2,400 x 1,200dpi and a below-£100 price tag

Sitting in the middle of Lexmark's latest range of photo-quality inkjet printers, the Z42 claims to be the very first sub-£100 printer to offer a top resolution of 2,400 x 1,200dpi. Not only that but it also offers fast print speeds of 10ppm for mono and 5ppm for colour. The Z42 uses the same curvaceous chassis as its two stablemates – the Z32 and Z52 – providing a 100-sheet input tray and a 50-sheet output tray at the front. The Z42 also employs Lexmark's AccuFeed roller system that improves paper handling reliability and allows it to use heavier media. Both parallel and USB ports are provided but bear in mind that the manual only mentions Windows 98, not ME or 2000.

Although the Z42 is undoubtedly a speed demon you'll only see the top speeds when printing in the draft 300 x 600dpi mode and even then only if each page has a minimal amount of coverage. A draft 12-page document with approximately five per cent text per page was delivered in 103 seconds at 7ppm and this dropped to 4.8ppm in 600 x 600dpi normal mode. Add a splash of colour and watch speed fall further as draft and normal mode prints off a 10-page document with a few colour charts and graphics returned 3.5ppm and 1.5ppm respectively. Bring a good book when printing full-page colour photographs as the Z42 took nearly 20 minutes to complete our test print at the highest resolution.
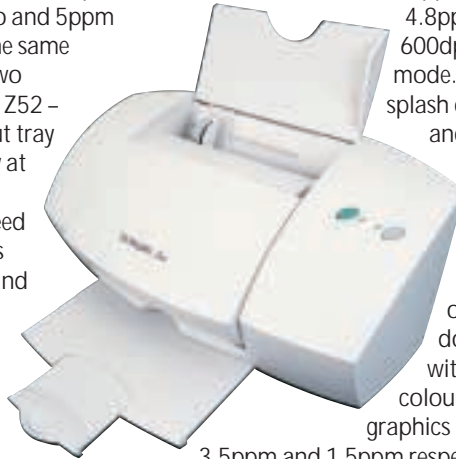
Print quality for business use is good, especially as the Z42 produced remarkably sharp and solid text in normal mode, while colour charts and graphs were reasonable. Photo quality was also good, although the colours looked slightly washed out. At the highest resolution a noticeable graininess was present but, for a sub-£100 inkjet printer, the results were quite impressive.

DAVE MITCHELL

DETAILS
★★★★
PRICE £99 (£81.68 ex VAT)
CONTACT Lexmark 01628 481 500
www.lexmark.co.uk
PROS Low price; fast print speeds; excellent text print quality
CONS Average colour quality; top speeds only in draft mode
OVERALL A good all-round colour inkjet with a low price, fast print speeds and good overall print quality

AIT Link-IT

A security tag that gives you the authority to get online wherever in the office you may be

The Link-IT system from AIT consists of a radio frequency identification card and a small radio receiver or reader. The identity card constantly transmits a unique identification code every second to the receiver, and as long as it receives this code, the computer remains operational. However, as soon as the receiver no longer receives the code, the Link-IT screensaver kicks in. As each Link-IT tag has a unique identity number, the software can be configured to recognise a specific tag as the one authorising use of the computer. It's also possible to configure multiple readers to accept one tag, making it easy to set up 'hot-desking' in a networked environment.

Installation is pretty simple. You plug the reader/receiver dongle in to a free nine-pin serial port on your PC. In order to make this a little more 'visible' a short serial lead is also provided so that the dongle can sit at the front of the PC rather than the rear. A USB version is also available. The supplied software is located on a CD-ROM and installing it takes just a few seconds. Then you clip on the name-badge sized access tag.

So long as you're in range of the dongle tag (about three or four metres) nothing happens to your PC – it works perfectly normally. But move outside of that range and the Link-IT screensaver kicks in. The only thing that makes the screensaver disappear is when the RFID access card comes back in range. You don't actually have to be in front of the PC, just in range.

You can't circumvent the security by unplugging the tag from the serial port, or by rebooting the PC. And if the PC is nicked, it won't easily work without the access card, although the hard disk could always be reformatted. A version of Link-IT is available to track assets, such as laptops, leaving and entering the building. Only those laptops accompanied by both tags can pass otherwise alarm bells ring.

ROGER GANN

DETAILS
★★★★
PRICE £82.25 (£70 ex VAT)
CONTACT AIT 01827 311 331
www.ait-linkit.com
PROS Simple concept that works well. A 'no-brainer' security system
CONS Don't lose that access tag!
OVERALL If you have a PC in a public or semi-public place, or use it to keep sensitive information Link-IT will prove very useful

Samsung laser printers

The ML4050 and ML6040 are part of a range of seven printers targeting the lower-end market

Compared with heavyweights such as Hewlett-Packard, Samsung is a relative newcomer to the UK laser printer market. Nevertheless, it has produced some excellent printers in the past couple of years that offer a good combination of speed, quality and value. Samsung continues its assault on the competition with the introduction of a group of seven new mono lasers aimed at personal users, small businesses and corporates. On review here are the ML4050 and ML6040 models that sit at the lower end of the range and offer a top true resolution of 600dpi plus print speeds of 8ppm (pages per minute) and 12ppm respectively.

The ML4050, or 'IZZI' as Samsung affectionately calls it, is its entry-level model and a modest price tag of only £149.99 ex VAT makes for a tempting proposition. It's equipped with a 35MHz processor and 2MB of memory but uses a Windows GDI printer driver. This is a cheaper alternative to PCL (printer control language) drivers as it expects the host PC to render the pages into bitmap and does away with the need for a fast processor and loads of onboard memory on the printer's controller board. The upshot is that performance will depend on the specification of the host PC. We found our P200 test system with 64MB of memory and running Windows 98 SE was well up to the job, with the ML4050 delivering good print speeds across a range of document types. A simple 15-page Word document was completed in just under two minutes at an average of 7.8ppm, while a 10-page heavily formatted DTP-style document was delivered in 75 seconds at 8ppm.

Print quality was less impressive and something of a mixed bag. As you'd expect for a 600dpi laser, text at normal font sizes was pin sharp, but smaller point sizes were ragged and poorly reproduced. Photographic images and graphics benefited from high levels of detail and smooth greyscales while banding was kept to a minimum.

The ML4050 is simple enough to install and Samsung provides a parallel cable along with Windows 95/98/NT and 2000 drivers. It's well built and comes with a 150-sheet paper slot at the rear plus a smaller multi-purpose slot for single sheets or envelopes. A comprehensive control panel provides status LEDs for paper, data and errors, and you can manually cancel the current print job, reprint the last page and select a toner-saving mode. Be prepared for high running costs though as the chunky toner cartridge (£49.99 ex VAT) lasts for 2,500 pages at five per cent coverage, which equates to an uncomfortable two pence per page.

Next up the ladder comes Samsung's ML6040 which targets workgroups and small offices. Top resolution stays at 600dpi but processing power gets a boost to 66MHz while memory has been increased to 4MB, although this cannot be upgraded. However, also being a GDI printer, the ML6040 relies on host PC horsepower. Along with the standard parallel port, the ML6040 also offers a USB port and the single lower paper tray has room for 270 A4 sheets. Printing costs are far more acceptable as the toner cartridge (£65 ex VAT) lasts for 6,000 pages at five per cent coverage and can deliver a page for only one pence. Using the same test PC, we found quoted print speeds spot on with our 15-page document churned out in 75 seconds and a 12-page DTP document done and dusted in just over one minute. Print quality is superior to the ML4050 as text was razor sharp right down to the smallest sizes while graphics and photographs showed good levels of detail and minimal banding.

With a price tag of only £224 ex VAT, the ML6040 looks very good value although upgrade potential is severely limited so if you want network printing you'll need to consider the ML6060 (£262 ex VAT), which supports an optional print server card and also offers PCL6 drivers. Even so, of the two printers reviewed, the ML6040 is the more impressive as it offers features well suited to the target market with good print quality and output speeds and all at a very reasonable price.

DAVE MITCHELL

The Samsung ML4050 (left) and ML6040 (right)

Nokia Cardphone 2.0

A dual-band cardphone that is an ideal addition to any well-wired traveller's overnight bag

First we had PC Cards that linked to mobile phones to provide a wireless connection, then we had software modems that did away with the card, now we have cards that do away with the phone. The Nokia Cardphone is small and light, and turns a Windows CE PDA or notebook computer into an online device pretty much wherever you are. The Nokia Cardphone 2.0 is both dual band and HSCSD. Dual band means it will work on Orange and One2One, and HSCSD means it supports data rates up to 28.8Kbits/sec – something it can only do in the UK on Orange since that is the only network with the HSCSD infrastructure.

Using a notebook on Orange with 14,400 compression and the two channels you really do get 28,800bits/sec. Suddenly, it's worth using a mobile device for browsing the web. The Cardphone is very much designed for use with a Windows device, although other drivers are in varying stages of availability. The documentation is poor: it only covers installation, albeit in several languages. To find out about the software with the card you have to read the online help that rather assumes you've got it installed. In our testing, all applications seem to work happily: even Windows Hyperterminal used the card without any problems. The shareware program Commnet, which bypasses a lot of the Windows system, worked too.

The software is great for managing SMS text messages with a Windows Explorer view of devices. You can use several SMS service centres and set call diverts – which is especially useful if you want to take voice calls on another phone. The Nokia Cardphone will handle voice through a plug-in headset.

It's an ideal system to leave in a hotel room, with your computer plugged into the mains waiting for incoming faxes. You can also use it as a hotel-based printer by faxing the hotel and then going downstairs to pick up the printout.

How useful the Cardphone proves to be in practice depends on how you use it. Our experience was that you really need mains power. High speed draws almost twice as much power as a standard connection, and on a Sony Vaio – which sacrifices battery life for weight anyway – you can almost see the battery gauge retreating. I got about 40 minutes out of a fully charged battery. Incidentally, mobile phone life is very much a moving target, if you are close to the cell you'll get a lot of time, but move further away and it drops dramatically. This test was done in particularly good coverage and without moving – as you switch from cell to cell the hand-off uses a little more power.

If you work away from a fixed line and want simultaneous voice and data – for example an architect who works out of a Portacabin, then it's ideal. You'll probably want a separate phone line for data and so have two contracts, or one of the multiple contract deals like Talkshare. When Orange announced the Cardphone it said that there would be no extra charge for using high-speed data even though this meant you were using the space on the network taken up by two voice calls. When the device was introduced a fixed charge of £5 a month for the service was announced. Peak rate Orange costs between 15p and 30p a minute, so that's about half an hour of connect time a month you need at high speed to break even. In some ways this is worse than paying by the second for high speed as you can't be certain that you'll always get a connection. In central London there doesn't seem to be any problem, but when I'm in London I have access to a fixed line. When travelling along the M1, rates seemed to vary, sometimes dropping to 19.2Kbits/sec and often dropping the line altogether. A week on a canal boat around Oxford didn't see a single 28.8 connection. However, infrastructure roll-out is often rapid so it's hard to say what it will be like by the time you read this.

When you do get a high-speed connection it is all that it promises: a realistic tripling of data speed. A file that took an average of a little over 28 minutes at 9,600bits/sec over a number of attempts took a shade over 10 minutes at 28,800bits/sec. If you are used to ISDN or better it still seems painfully slow but if you've been tied to 9,600bits/sec the difference is amazing.

No-one would have a Nokia Cardphone instead of a mobile. It's an addition for the well-wired traveller. This makes pricing interesting, as many people will want to buy it without a contract. The price with contract is £299, plus another £150 if you don't sign up. An alternative option is the new Nokia 6210 phone. This also does HSCSD and has an infra-red connection, and if you want something to work in the US there is the forthcoming Siemens S40 that supports HSCSD and triple band – although it's unlikely that you would get a high-speed connection in the US as any connection there is a bit hit or miss.

SIMON ROCKMAN

DETAILS
★★★★

PRICE £299.99 (£255.31 ex VAT)

CONTACT Nokia 0990 003 110

www.nokia.com

PROS Usable data on the move in a very neat package

CONS Higher speed means you'll use it more and the phone bills will soar

OVERALL Cardphone makes the Internet usable while you are on the move. Performance still isn't great and you need to keep an eye on battery usage – in a PDA your battery bill might be higher than your phone bill

Adobe Photoshop 6.0

Getting to grips with everything that the latest Photoshop has to offer takes time but it's worth it

Looking forward to a new version of Photoshop is a little like waiting for Christmas and this year's box of goodies won't disappoint even the most hardened of image-editing scrooges. Adobe has, once again, worked its magic and managed to push the boundaries of pixel painting further than anyone could have imagined.

Photoshop 6 offers powerful vector editing and masking capabilities, greatly improved layer control, a more powerful array of web publishing tools, expanded and easier to apply layer styles, and a revised interface that reduces screen clutter and boosts productivity.

As before, Adobe has placed equal importance on interface improvements and feature additions. The most obvious change is the appearance of the context-sensitive tool options bar. This sits at the top of the screen below the menu bar and provides a quick way to select tool parameters and options. It takes the place of the old tool options palette, and in most cases offers far greater control.

With the marquee tool selected, for example, there are four mode buttons – new selection, add to, subtract from and intersect – previously only available as keyboard modifiers. You can also define the feather pixel radius, style (normal, constrained, fixed-aspect ratio) and, if the latter option is selected, the size.

With the brush tool selected the options bar shows the blend mode pull-down, opacity slider, wet edges checkbox and brush dynamics. The brush style is also selected from a button on the options bar that displays a pop-up panel. You can't tear this off, but you can resize it. It also has its own menu, accessed from a triangle button to provide loading and saving options, view modes and access to brush libraries. Why can't you tear these off? Adobe's aim is clearly to reduce screen clutter and the tool options bar eliminates the need for all those palettes, while at the same time providing more control when you need it.

On the right-hand side of the tool options bar, the palette well provides a convenient place to tidy away loose palettes, thereby saving on-screen space. If you click on a palette in the well it expands so that you can use it, then tucks itself away when you've finished. In practice, with more than about five or six palettes, the tabs become difficult to read, but it does mean that the only
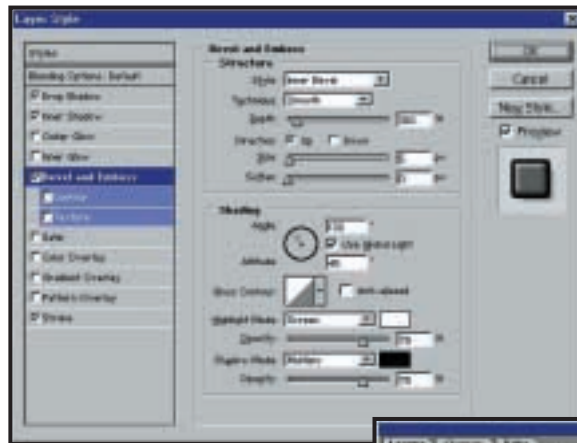
palette you really need to float is the layers palette – everything else can be got at from here or the tool option bar. The layers palette has been reorganised so that with complicated multi-layered images you can find individual layers more easily and apply commands to groups of layers. With the removal of the 99-layer limit, improved organisation is a must. Layer sets can be grouped into colour-coded folders that expand to reveal their contents when you click on them.

You can show and hide layer sets, and apply overall blend modes and opacity. The default blend mode for layer sets is 'pass through' – so all the layers inside the set look the same as they would have done outside. When you choose a different mode all the layers in the set are composited, then the layer set blend mode is applied, so any individual blend modes for layers within the set are kept.

Two new locking modes have been added – lock image pixels and lock position. The former prevents painting on a layer (though you can move or transform it), the latter lets you do anything other than move or transform the layer. Layer effects have been renamed 'layer styles', but much more than just the name has changed. Layer styles provide many more effects, much greater control over effect parameters, the ability to create and save styles and several libraries of preset styles designed for buttons, text and images. The layer effects dialog has been replaced by the more complex layer style dialog that appears whenever you select one of the layer styles or blending options from the

layer/layer styles menu. New options include satin, stroke and colour, gradient, and pattern overlay. Regardless of which style you choose, the layer style dialog is split into two areas, so you can select, modify and apply any of the available styles from one location.

As before, drop shadow has a drop-down menu for setting blend mode and an opacity slider, and angle wheel and three sliders to control distance, spread and size. Below this a quality panel provides access to preset edge contours (which you can define) and a slider for adding noise. Bevel and emboss provides too many controls to list – in addition to five style options, technique, depth direction, size, soften, angle, attitude, gloss contour, highlight mode and opacity, being a sample. Two sub-categories provide additional settings.

Layer styles provide an incredible degree of customisation; by adding them to the layer styles palette you can apply them to other layers, quickly applying an overall style to elements.

New vector shape drawing tools provide another shortcut to fast, easily-edited graphics. The rectangle, rounded rectangle, ellipse, polygon, line and custom-shape tools are all available from a one-button flyout on the toolbar. Vector shapes are not a new thing in raster image editors, but Adobe has taken it to new levels by providing previously undreamt of functionality and power.
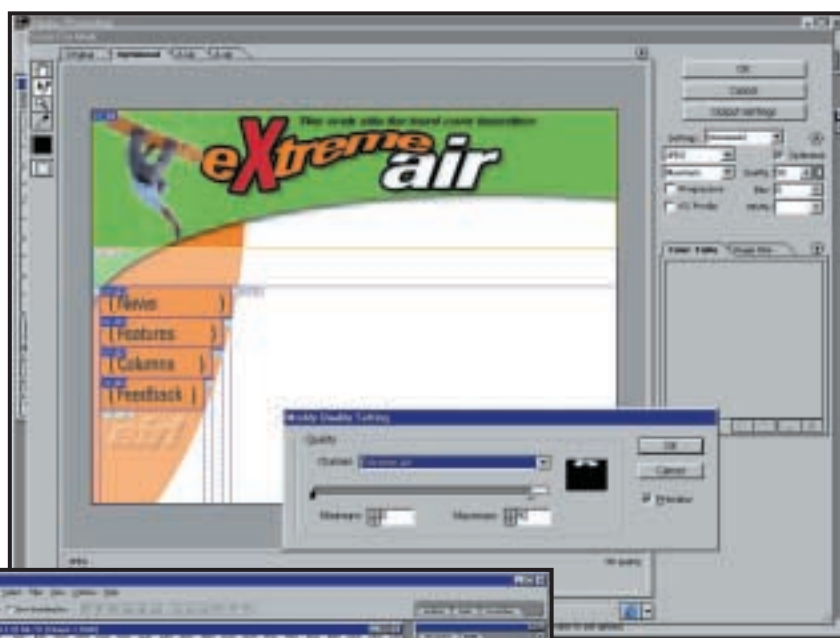
The first use of the shape tool creates a new shape layer and then each shape you draw is added to this layer (unless you specify otherwise). The shapes can be edited using the direct selection tool or the pen tools to move, add and remove anchor points. The tool options bar provides buttons that allow you to subtract, intersect and exclude overlapping shape areas, like Illustrator's pathfinder palette, with the difference that they remain editable.

Shape layers act as vector 'layer clipping paths'. Layer masks – bitmap layers that hide or reveal underlying layer detail depending on pixel values within the mask layer – are one of the most utilised Photoshop compositing features. The advantage of layer clipping paths is that they can be resized, distorted and otherwise manipulated without the degradation that might result in a pixel-based mask.

Version 5.5 considerably improved Photoshop's previously mediocre text capabilities, but version 6 goes all the way, providing the kind of control that you'd expect from a vector, or even DTP layout application. A pleasant surprise is that text is removed from the confines of a dialog box. Again, the tool options bar makes formatting as simple as in any text editor, with pulldown menus for font, style, size and anti-aliasing.

For those who like their web features under the same roof as their image-editing controls, Adobe has introduced a slice tool and dynamic layer-based slicing. Layer-based slices are created around the outermost pixel boundary of the image, the idea being that you create each element of your web page on a separate layer then get Photoshop to slice it up for you. If you jump to Image Ready all the slices make the trip, along with layers, channels and everything else.

Hand in hand with the new slicing tools, weighted optimisation lets you use an alpha channel to set image optimisation on a per-pixel basis. Where previously you could only set

optimisation parameters for an entire slice you can now use an alpha channel to mask irregular areas – say a logo – and apply different optimisation settings for it.

Image Ready itself gets a major overhaul, with the introduction of rollover styles, tweened animation, slice sets and improved image map tools. Creating new rollover states in the rollover palette is easier than ever and you can preview the results without having to switch to a browser. Three-state rollovers created using layer styles can easily be saved and applied to other graphics.

As in Fireworks, it's also possible to define a tweened animation as one state of a rollover. The great thing about Photoshop is the way that the shapes, styles, layers, and masking features integrate with the web tools.

Photoshop 6 has quality in depth. The new crop tool provides a dimmed preview, an option to hide rather than remove the excess, and a perspective correction feature. The new liquify tool works like Goo to produce freeform distortion of images, is restorable and easy to use. The extract image command

has added smart highlighting, mask edge and mask cleanup tools making it quicker and easier to produce cutouts.

A preset manager lets you browse, save and delete all your custom shapes, brushes, gradients, contours, patterns and layer styles in one place.

Getting to grips with everything this superb version of Photoshop has is going to take a while, but it will be worth it.

KEN MCMAHON

Above: Applying channel-based optimisation to the top slice – the extreme air logo gets preferential jpeg optimisation

Left: Buttons on the tool option bar determine how vector shapes interact. The styles palette lets you quickly apply styles to both shapes and text

DETAILS

PRICE £564 (£480 ex VAT)
CONTACT 020 8606 4001
www.adobe.co.uk

SYSTEM REQUIREMENTS Pentium processor, Windows 98/NT4/2000/ME, 64MB of RAM (128MB to run Photoshop and Image Ready concurrently), 125MB of hard disk space, 800 x 600 display resolution
PROS New vector tools; superb text handling; layer styles
CONS No layer styles dialog in Image Ready
OVERALL The most impressive and capable version of Photoshop yet. If you're serious about your digital pictures you've gotta have it

MGI PhotoSuite 4

You would be hard pushed to find a match for PhotoSuite for under £50, but it has its limitations

In the past few years, PhotoSuite has established a reputation as one of the better quality home digital darkroom applications. If you're looking to spend in the region of £50 on software to get the most from your digital camera it's going to be a three-cornered contest between PhotoSuite, Microsoft Picture It! 2000 and Adobe PhotoDeluxe 4.

MGI has always understood the significance of the web to digital photography, so much so that PhotoSuite is actually based on Internet Explorer. With version 4, PhotoSuite becomes even more web-centric, with tightly integrated connections to online photo finishing services like Kodak's Photonet online and GatherRound.com, and improved web publishing and email features.

New features include transparency, a range of options for creating cutouts and photomontages, a 'photosprayer' tool, new special effects and Photoshop plug-in support. The stitching and panorama features have been extended – the five-image stitching limit has been extended to 48 and it's now possible to create immersive 360-degree panoramas based on MGI's Photovista application. An animated gif editor, standalone image viewer application, wallpaper and screensaver creator, support for MP3 music files and a new set of images, props and templates complete the picture.

Though it's been given a makeover, the PhotoSuite interface retains its original framework. The Platinum Edition 'homepage' introductory screen displays six large icons providing access to the program's main activity areas – get, prepare, compose, organise, share, print and browse. A library window to the right of the editing window provides a permanent holding area for collections of pictures that can be dragged and dropped onto the edit window and a context-sensitive panel on the left provides step-by-step guidance through editing activities. This is supplemented by a toolbar so you can just dive straight in.

The 'prepare photo' section provides six function buttons performing a variety of editing options from simple rotate
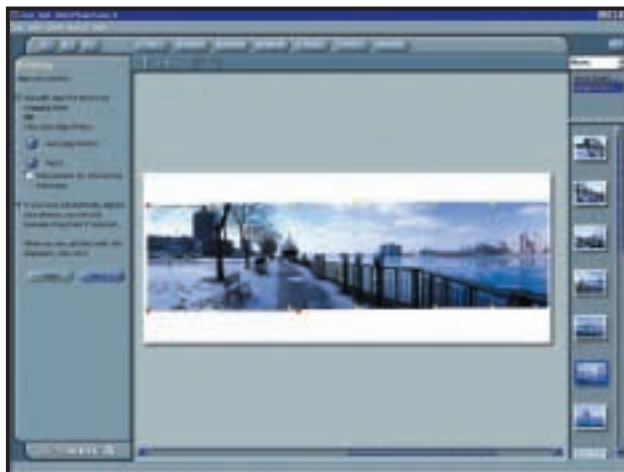
PhotoSuite has excellent stitching and panorama features

and crop to cutouts, special effects, touchup, stitching and phototapestry. If you click on the touchup button the panel is replaced by a new set of buttons offering eight options including removal of red eye, scratches, blemishes and wrinkles, plus touchup brushes.

Many of these options, the removal ones for example, simply select the relevant tool and provide three-step guidance along with adjustment options that, for beginners, is fine. If you select the touchup filters you get a new panel with a pulldown menu of filter options including colour adjustment, sharpen, and brightness and contrast.

The browser format makes the whole process very linear – from the prepare section to the sharpen filter takes three clicks – and it's easy to backtrack using the navigation buttons.

Often, though, the help runs out just when you need it most. The default setting for the sharpen filter is the maximum, which leaves most images looking decidedly grainy. However, there's no suggestion as to what might be an appropriate alternative for most images, or warning on the dangers of too much sharpening. Likewise, the Fix colours and Colour adjustment tabs provide sliders for making colour balancing adjustments with no advice on how to use them. Beyond superficial explanation there's little in the help file.

The cutouts tab provides a good selection of tools including a magic wand, freehand and edge finder. Using this last one you click points around the edge of the foreground subject and the tool determines the path based on

contrasting edges. It does a good job and you can make adjustments before either cutting the foreground subject or inverting the selection and removing the background.

For a bit of montage fun this is perfectly adequate, but if you were able to feather the selection you could achieve much better results and this reluctance to provide users with a bit more control is one of PhotoSuite's pitfalls. Transparency is a powerful feature, but in the absence of any real layer control it is of limited use.

PhotoSuite has some original and interesting features that you won't find in other applications. You'd have to look to a dedicated application for stitching and panorama features to match these, and the phototapestry feature, which reproduces a large image using up to 2,000 thumbnail photo tiles, is good fun. You can now create your own tile database from photo collections and insert a single personal tile into a tapestry, creating a *Where's Wally?* type puzzle for kids.

As you'd expect from such a highly web-centric application, possibilities for creating web-based animations, slide shows and interactive panoramas are excellent. The templates provided are, however, a bit of a disappointment and fall well short of the quality of material provided by Microsoft and Adobe.

KEN MCMAHON

DETAILS
★★★★

PRICE £49.99 (£42.55 ex VAT)
CONTACT MGI 0800 973 830
www.mgi.com
SYSTEM REQUIREMENTS Windows 95/98/ME/NT4/2000, Pentium 166MHz, 32MB of RAM, 800 x 600 resolution display in 16-bit colour, 200MB of hard disk space for full install
PROS Good feature set; web browser interface
CONS Inadequate help; no layers; unsophisticated image-editing tools
OVERALL Good choice for beginners comfortable with web browser format, panographers and web album producers

L&H Voice Xpress versus Dragon NaturallySpeaking

Despite L&H's acquisition of Dragon it still offers two different speech recognition products

The maturity of modern speech recognition packages closely mirrors that of OCR (optical character recognition) – both now offer accuracy tantalisingly close to perfection but attaining those last few percentage points has proved disproportionately difficult. A couple of years ago you could reasonably expect 90 per cent accuracies from these products, while last year this figure increased to at least 95 per cent, maybe more. Speech recognition as accurate as this is an undoubted boon, allowing you to be more productive at your PC, so long as you have sufficient PC speed, an adequate sound card and microphone and the ability to speak clearly at all times. Oddly enough, it remains a niche product – successful in the medical and legal communities, popular with SoHo users but largely shunned by corporates.

There have been a few changes in the speech recognition market since last year – Lernout and Hauspie (L&H) has taken over not only Dragon Systems, but Dictaphone as well. With Kurzweil already under L&H's belt, the number of players in this market is rapidly shrinking – only IBM and Philips now offer any competition. Interestingly, L&H has not, so far, merged the NaturallySpeaking and Voice Xpress product lines and the new versions still employ separate code, though Jo Lernout, co-founder of L&H, recently indicated that the code base of the two products could eventually merge in future releases.

Both products have continued to evolve, however, and both are noticeably better than their forebears. We tested both L&H Voice Xpress 5.0 and Dragon NaturallySpeaking 5.0 on a modestly specified PC – with a 500MHz AMD Athlon processor, 128MB of RAM and a SoundBlaster Live! sound card.

As before, Voice Xpress 5.0 is available in several flavours; the Standard version costs £40, the Advanced version, which includes support for Microsoft Word, costs £80. Meanwhile, the Professional version, which offers improved support for Microsoft Office users, sells for £120, while the Mobile Professional version,

which includes a handheld voice recorder, sells for £200.

NaturallySpeaking has a similar product line. There are three versions – Essentials, Preferred and Mobile, priced at £30, £100 and £180, so they're cheaper than their Voice Xpress 5.0 equivalents.

The installation and enrolment process continues to improve. Once installed, both products invite you to set up your microphone and fine-tune the levels. The new version of Voice Xpress now comes with a rather cute Plantronics headset, while Naturally-Speaking comes with a more conventional Labtec headset. One of our gripes from last time we reviewed this package remains unaddressed: sound cards now have colour-coded sockets to simplify plugging the right plug in to the right socket but neither headset follows these conventions.

Although NaturallySpeaking has much more comprehensive printed documentation, Voice Xpress has far more online assistance, with plenty of online hints and tips, demonstration videos and even an interactive cartoon café, where you can learn more about using the package. Overall, Voice Xpress, is more consumer-friendly, while

NaturallySpeaking is more suited to business use.

Once your microphone is set up, you then have to enrol your voice by reading out a script – both packages offer you a choice of reading material. In both cases this process takes a little over five minutes, with a further couple of minutes of data processing, remarkably short times, especially when you then get extremely accurate recognition scores from then on. Both passed our Peter Piper tongue twister test immediately with no errors, which is remarkable. Much of this accuracy is down to fast processors – while both products advise a minimum of a 200MHz or 266MHz processor, we found a 500MHz processor just about acceptable.

Both packages can scan your existing documents to check for special words not in their extensive vocabularies. These can also be drawn from spreadsheets and databases. Some words are automatically added but a few will need to be specifically trained. Naturally-Speaking wasn't quite as good here as Voice Xpress – for example, Voice Xpress happily processed Word doc files, even though Word wasn't installed on that PC. NaturallySpeaking, however, couldn't process the same files. This was because of the limited file formats supported by DragonPad (Naturally-Speaking's mini word processor) – rtf is about as close as it gets to doc files.

As far as interfaces go, both products are now very similar. Both install a toolbar that sits at the top of the screen,

Above: Voice Xpress has far more online assistance, with an interactive cartoon 'café' where you can learn more .
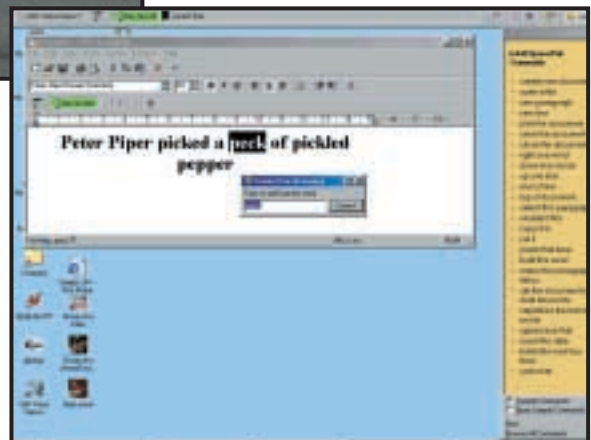
Right: Both packages passed the Peter Piper tongue twister test immediately without any errors

from which you can control and configure the various settings – this is unobtrusive on a 1,024 x 768 display. Voice Xpress also lets you display a cue-card panel on the right-hand edge of the screen to let you know what verbal commands are available. By contrast, NaturallySpeaking only offers this useful facility as a part of its online help. Both packages offer a WordPad-like mini word processor, which is our preferred vehicle for getting text on to the screen.

As well as common dictation, both packages allow you to control your desktop and applications through spoken commands. This is a mixed blessing, as sometimes it's quicker to use a hot-key or mouse click than it is to say it. Of the two, Voice Xpress remains the leader, thanks to its Natural Language Technology, which can be used (depending on the version you have) in Microsoft Word, Excel, PowerPoint, Outlook, AOL, NetMeeting, Internet Explorer, Windows Explorer and on the desktop. By contrast, the more limited Natural Language Commands offered by NaturallySpeaking can only be used in Word. Natural Language support means that you can express a command in several different ways ('make it bigger', 'increase by 10pts', 'enlarge that') and still be understood. This is one area where Voice Xpress wins hands down.

The boot is on the other foot when it comes to the correction process. Both packages make it a simple task to go back and correct mis-recognised words (an important task, necessary to maintain accuracy) but Naturally-Speaking can play back a recording of your dulcet tones, while Voice Xpress relies on its, admittedly impressive, RealSpeak technology to read back what it has recognised, which isn't the same thing. So while you might have said, 're-evaluate', it might have been recognised as 'Rio value weight' and it's the latter that RealSpeak will read out, which doesn't help the correction process. On the up side, if you're fond of listening to your documents or emails being read out to you, while both products offer text to speech conversion, Voice Xpress is the clear winner. One useful new feature in Voice Xpress is NBS, or Nothing But Speech, which is designed to eliminate the 'umms', 'errs' and 'ahhs' that pepper our normal speech. We found this feature works quite well, and, try as we might, our 'errs', 'umms' and 'ahhs' were all suppressed and not recognised as 'real' words, as they were in NaturallySpeaking.

The recognition accuracy of both packages is up on their previous versions (which weren't at all bad) but gaining those last percentage points of accuracy is hard when you're at 95 or 96 per cent. Their 'out of the box' accuracy, after just a few minutes' training was remarkable – so long as you don't deal them anything weird, such as song lyrics, but stick to business-oriented prose, where accuracies in the high nineties are easily achieved from the off. While there was very little difference in the overall recognition accuracy, we felt that NaturallySpeaking had the edge over Voice Xpress. One niggling feature that hasn't gone away is Voice Xpress' habit of mis-recognising a word that it has already correctly recognised a few lines earlier such as the command 'new line', which comes out as text – 'the line'. Similarly, while there wasn't much difference between the recognition speeds of the respective products, our perception was that NaturallySpeaking could throw text up onto the screen a little quicker than Voice Xpress.

ROGER GANN
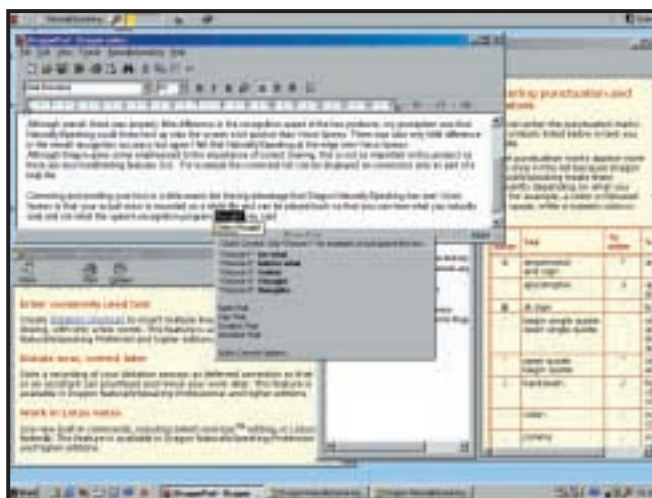
Though weak in Natural Language commands, Dragon NaturallySpeaking wins hands down on dictation and its speech recognition abilities. It is also easier to use and cheaper

DETAILS
★★★★
L&H VOICE XPRESS 5.0 PROFESSIONAL
PRICE £120 (£102.12 ex VAT)
CONTACT L&H 0800 056 0539
www.lhsl.com
PROS Good accuracy scores; plenty of features and nice touches; NLT a real boon
CONS No dictation playback
OVERALL Voice Xpress 5.0 remains a mixed bag. Overall, it has more functionality than NaturallySpeaking 5.0 but it still can't beat it when it comes down to the business of turning what you say into text

★★★★★
DRAGON NATURALLYSPEAKING 5.0 PREFERRED
PRICE £100 (£85.10 ex VAT)
CONTACT L&H 0800 056 0539
www.lhsl.com
PROS Good accuracy scores; slightly faster
CONS Weak Natural Language commands
OVERALL It may not have the laundry-list of features that Voice Xpress has but where it counts, speech recognition, it's still the one to beat. Though weak in natural language command support, this is the best for dictating

Serif WebPlus 6

WebPlus 6 may not be that sophisticated, but as with Serif's DTP packages it is easy to use

Serif has an impressive pedigree when it comes to producing publishing packages that are filled with nifty features and yet still remarkably easy to use. Whether you plan to publish your work on paper or online, or maybe both, you should have no problems finding a program in Serif's ever-expanding software library that does the trick and won't cost the earth.

The latest addition to the range is WebPlus 6. WebPlus is a WYSIWYG home page creator, so there's no grandeous 'Website Construction Suite Deluxe' moniker here. Instead, simple but effective pages created with the minimum of fuss are the order of the day. This said, Serif does claim that the program comes with 'everything you need to create exciting web pages... fast!' and while this may be stretching the point a little, for less than £30, we see little cause for complaint.

First impressions count and thankfully, unlike Serif's DTP package, PagePlus, which comes with 11 additional CD-ROMs, all of these web-oriented extras (and the program itself) are crammed onto just one disc. The quality of these extras – some 20,000 web art images, 600 animated gifs and 400 fonts – is variable to say the least but as you'll soon build up your own favourites, the program is where our focus should lie. Installation is a painless affair, so much so that you won't even need to reboot, and once the package has loaded, if you're the kind of person who expects great results with just a few clicks, you won't be disappointed.

At its most basic level, getting up and running is a simple matter of selecting a style for your page from the panel that runs down the right-hand side of the screen. Next, choose a colour scheme from the selection on offer and click OK. You can then modify your newly created page to your heart's content. The main screen is logically thought out if a little non-standard (and should be more than familiar to PagePlus users). If you do need help there are wizards to take you through the package step-by-step and even a number of animated quick tours covering the main features. While beginners will welcome these features with open arms, proficient users wanting quick results will be glad of the opportunity to turn off the handholding extras and the ability to add HTML code
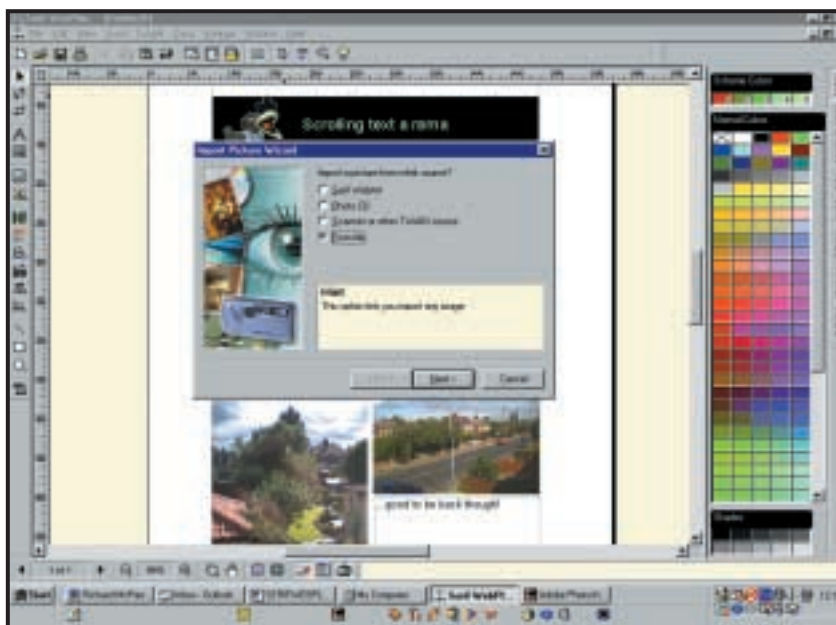
WebPlus 6 lies between a DTP package and some of the more basic web page creators

or Java scripts to their pages. If you prefer to create a page from scratch, WebPlus is as easy to use as any desktop publisher. Simply set up your page, add some boxes for text and illustrations using the toolbox and pulldown menus, and then juggle them all around on screen for best effect. Of course, Web-Plus is no mere desktop publisher, there's support for animated gifs and sounds on your pages and adding hyperlinks or hotspots is a piece of cake. While some web features are absent (mouseovers, for example), the program manages to pack in most of the tools and effects you're likely to need including text marquees.

Of course, even user-friendly packages can fall short when it comes to publishing your finished site. With the right information at hand it's easy enough, but novices can easily be scared off. WebPlus scores well on this count. On firing up the program for the first time you're encouraged to sign up for 10MB of web space from Visual Cities and when the time comes to publish your site the ftp address is already entered into the dialog box. You just need to supply the account name and password. Hopefully it won't be too much longer before this is the case no matter which company you choose for your web space.

So, the question is; with so many publishing and web design packages around, where does WebPlus fit into the equation? It obviously isn't aimed at the

kind of people who are likely to be tempted by FrontPage or Dreamweaver. Nor is it the most basic, handholding package you're likely to find on the shelves of your local software emporium. It's also not as feature-packed as a budget desktop publisher like Microsoft Publisher or Serif's own PagePlus. WebPlus lies somewhere between a DTP package and some of the more basic web page creators. In effect, what you get is a cut-down version of PagePlus that embraces the web while junking some of the fineries of printing for the page and if that's what you're looking for you can't go far wrong.

RICHARD MCPARTLAND

DETAILS
★★★★

PRICE £29 (£24.95 ex VAT)
CONTACT Serif 0800 376 7070
www.serif.com
SYSTEM REQUIREMENTS 486 processor, Win 95, 16MB of RAM (Win 95/98) 24MB (NT4), 64MB (Win 2000), 30MB of hard disk space, 16bit 256 colour SVGA graphics card. Printer, scanner and Internet account and connection optional
PROS A comprehensive, easy-to-use package
CONS A little limiting for the savvy web page creator; interface is a little non-standard
OVERALL A simple way of making a great looking web page with a minimum of fuss

Epson AcuLaser C2000

A fast, affordable A4 colour printer that boasts a wide range of network features

Think inkjet printers and Epson is a name that invariably springs to mind, as it has consistently held a strong position in this market.

Until now its colour laser printers have been limited to the large format EPL-8200, but the AcuLaser C2000 represents Epson's first move into A4 format colour printing. All four models in the range offer a top true resolution of 600dpi (dots per inch), which can be boosted to a simulated 2,400dpi using Epson's C-RIT image enhancement. On review is the base C2000 that comes equipped with 32MB of memory, a speedy 266MHz R5000 RISC processor and a built-in dual-speed network adaptor as standard.

The C2000 uses Epson's own Colour ESC/Page printer control language, instead of PCL5e or PostScript emulations. This is because Epson feels the former is too inefficient and the latter carries too many overheads. However, PostScript 3 support is included with the C2000PS (£1,849 ex VAT) and C2000PSDT (£2,699 ex VAT) models.
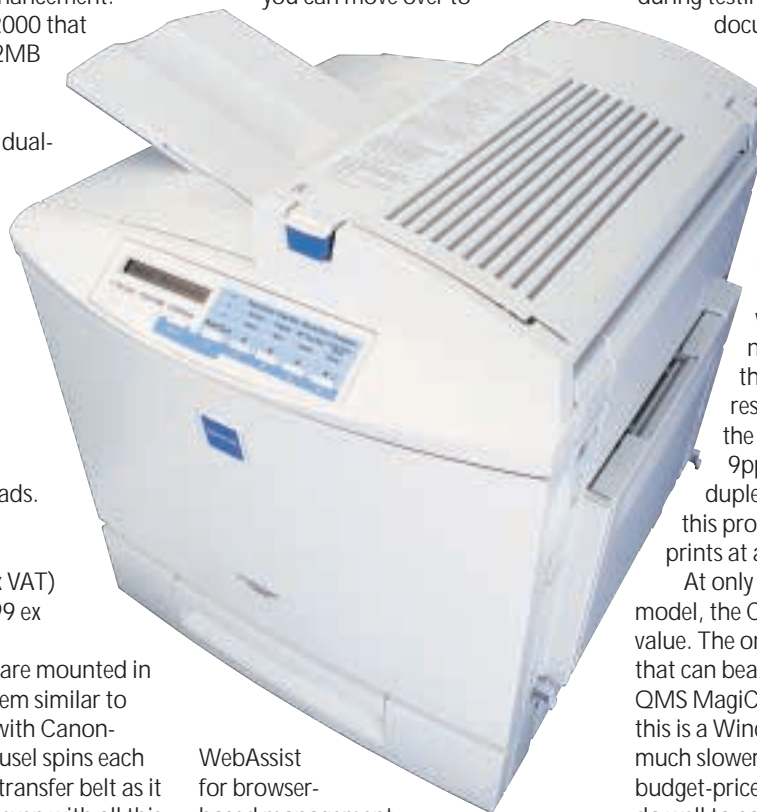
The toner cartridges are mounted in an internal carousel system similar to those found in printers with Canon-based engines. The carousel spins each cartridge around to the transfer belt as it builds up an image but, even with all this internal activity, we were impressed at how quiet the C2000 was during testing. The Cyan, Yellow, Magenta (£77.03 ex VAT each) and Black (£39.64 ex VAT) cartridges deliver 6,000 pages apiece, but there are plenty of other consumables to take into account.

The transfer belt (£175.83 ex VAT) lasts for 130,000 mono and 30,000 colour pages, while the drum cartridge (£53.02 ex VAT) and fuser oil roll (£25.67 ex VAT) both deliver either 30,000 mono or 7,500 colour pages. The fuser kit (£321.60 ex VAT) expires after 100,000 pages. All in all, this adds up to a very reasonable 6.9 pence for a four-colour page and 1.4 pence per mono page at five per cent coverage per colour.

Epson's WinAssist utility helps with network installation as it displays all discovered Epson printers using their MAC (Media Access Control) address.

Select one from the main window and you can assign an IP address and add basic NetWare details such as the NDS (Novell Directory Services) tree and context.

WinAssist is merely a basic tool to get the printer up and running on the network and once this has been achieved you can move over to WebAssist for browser-based management.

Epson has clearly worked hard on this interface as it is extremely well designed and easy to use. You can view the printer's settings and status, toggle it online and offline and check for any errors. The interface also provides plenty of information about consumables. Epson's Status Monitor 3 utility is built into the local driver and keeps each user up to date on printer status as well as paper and toner levels.

Hewlett-Packard's Color LaserJet 4500 is currently the printer to beat for colour output quality and our test results show the C2000 isn't the one to knock it off its podium. Photographic images printed at the highest resolution showed reasonable levels of detail with no discernable banding, but the driver had trouble with some darker areas as it produced a strange, negative-like effect. The C2000 also had problems reproducing correctly the CorelDraw Train image. Although stepping across colour fades was minimal, some areas of detail were missed completely.

If the C2000 disappointed on quality, it made up some ground in the speed tests. The engine is rated at 20ppm for mono printing and 5ppm for colour and it came close to achieving these speeds during testing, with a 15-page text document delivered in 47 seconds at an average of 19ppm (pages per minute). Colour speeds will depend on the amount of colour required. An 18-page document with a fair smattering of colour graphics, photos and charts was completed at a rate of nearly 8ppm – some way over the quoted speed. Dropping resolution down to 600dpi saw the same test completed at 9ppm. Epson also supplied a duplex unit for us to play with and this produced double-sided text prints at an average of 12ppm.

At only £1,599 ex VAT for the base model, the C2000 initially looks good value. The only printer currently available that can beat it on price is the Minolta-QMS MagiColor 2 DeskLaser, although this is a Windows-only printer that is much slower. Companies looking for a budget-priced colour laser printer would do well to consider the C2000, but if they want the best and are prepared to pay for it, then HP's Color LaserJet 4500 is still the top choice.

DAVE MITCHELL

DETAILS
★★★

PRICE £1,879 (£1,599 ex VAT)
CONTACT Epson 0800 220 546
www.epson.co.uk
PROS Low price; fast print speeds; good network management tools
CONS Below-par colour output quality
OVERALL A fast printer with an attractive price tag and plenty of networking features, but not the best choice if you're looking for top-quality colour output

GCC Elite 21DN

The Mac specialist ventures into the PC market with its Elite range of laser printers

It may come as a surprise to some people that when GCC started life in 1981, its main line of business was developing enhancements for coin-operated video games. It moved on to designing printer products for the flourishing Apple Macintosh market in 1984, but it's only now, with the introduction of the Elite range of mono laser printers, that GCC has decided to make a move on the PC-based market.

The Elite 21 series looks to be good value, with prices starting at £999 and all three models offering print speeds of 21ppm and a top true resolution of 1,200dpi (dots per inch). A welcome feature is the built-in dual-speed network adaptor. At this price many vendors only offer a print server as an optional extra, which can easily add an extra £200 to the asking price. In fact, the Elite range offers a comprehensive collection of interfaces, as you also get parallel, serial and USB ports.

The Elite 21DN on review uses a Fuji Xerox print engine and comes equipped with an 80MHz PowerPC processor.

Its 32MB of memory can be upgraded to 256MB using industry-standard SIMMs. This is fortunate, as we found the printer failed on memory overruns during testing at the highest resolution. Both PCL6 And PostScript 2 emulations are supported and the 21DN adds an internal duplex unit to the recipe for double-sided printing.

Physically, the 21DN is unremarkable and does little to stand out in a sea of beige, plastic, cube-shaped printers. Standard paper capacity from the single lower tray is 550 sheets of A4, while a multipurpose tray has room for another 100 sheets or up to 10 envelopes. Paper capacity can be increased significantly by adding up to two optional 550-sheet lower trays (£235 ex VAT each). The large toner cartridge (£155 ex VAT) has a lifespan of 15,000 pages at five per cent coverage, which equates to reasonable printing costs of a shade over one pence per page. This compares well with much

of the competition, although Kyocera still holds sway as its 18ppm FS-3750 can deliver a page for only 0.3 pence, delivering big savings over a number of years.

Configuring the 21DN for network printing is not the easiest task, as GCC doesn't provide sophisticated management tools such as HP's JetAdmin or Lexmark's MarkVision. The printer is designed to be managed over an intranet or the Internet and uses a web-based interface called WebAdmin.
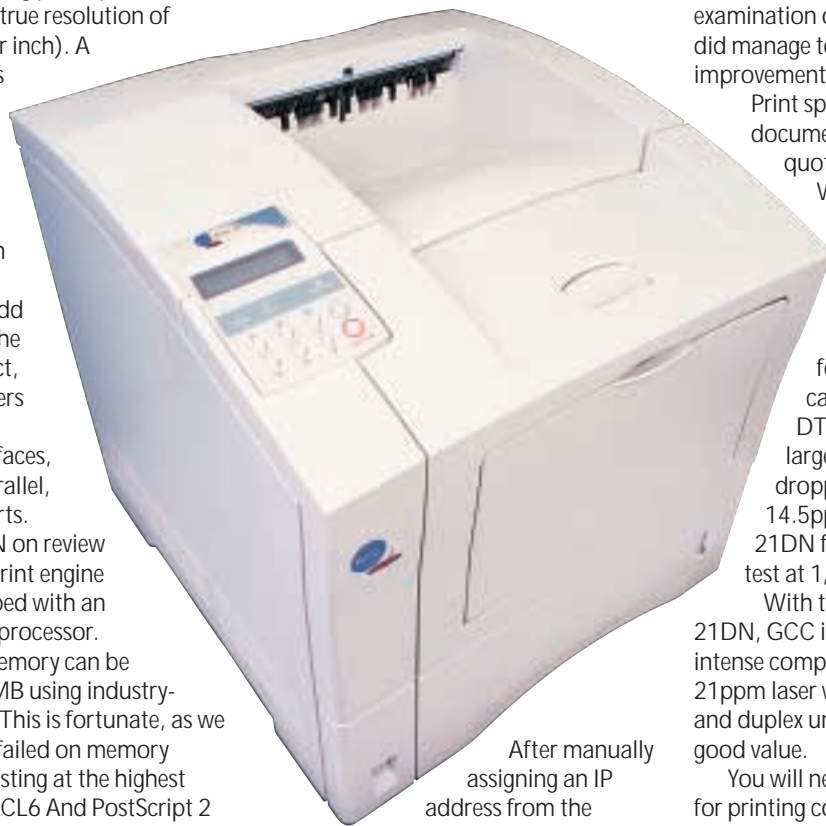
After manually assigning an IP address from the control panel you can use GCC's Map utility. This searches the network for GCC printers and displays them ready for selection. Choose the one you want to manage and it will fire up that device's web interface. From here you can view and configure all the printer settings that are available from the control panel such as the default resolution, paper sizes and toner density. Unfortunately, you can't view the status of consumables so there's no way of remotely checking how much toner is left or the amount of paper in each tray.

Text quality at 600dpi is easily good enough for most users, with even the smallest fonts looking pin sharp, but

you'll be hard pushed to spot any improvements at 1,200dpi. Graphics quality will depend on which driver you choose. We found the PCL6 driver produced unacceptably murky images using the default driver settings and required a lot of work with the density controls to improve it. It is far easier to go with the PostScript driver as the results even at 600dpi were far superior with good levels of detail, smooth greyscales and virtually no banding. The 21DN failed to complete the same tests at 1,200dpi, although a closer examination of the portion that it did manage to print showed small improvements in detail and contrast.

Print speeds for text-only documents were close to the quoted speeds, with a 28-page Word document delivered in 84 seconds for a tidy 20ppm. Running the same document through the duplex unit returned a reasonable 13ppm. Heavily formatted documents caused a few problems – a DTP-style document with large graphics and pictures dropped speed down to 14.5ppm at 600dpi and the 21DN failed to complete the same test at 1,200dpi.

With the launch of the Elite 21DN, GCC is moving into an area of intense competition, although for a 21ppm laser with built-in networking and duplex unit it does seem to be good value.

You will need to add more memory for printing complex documents, but print speeds and overall quality are up with the best, making it a good choice as a departmental workhorse.

DAVE MITCHELL

DETAILS
★★★

PRICE £1,409 (£1,199 ex VAT)
CONTACT GCC 020 8754 6000
www.gccprinters.com
PROS Built-in networking, duplex unit
CONS Weak network management features and insufficient memory
OVERALL A compact departmental laser printer with a good turn of speed and a fine specification for the asking price

PERSONAL COMPUTER WORLD
BEST BUYS
YOUR GUIDE TO TODAY'S TOP PRODUCTS ▶▶▶▶

ENTRY-LEVEL PC
Atlas
Meridian A750T

Based on AMD's Socket A 750MHz processor, an MSI K7T Pro motherboard and 128MB of PC133 memory, this machine makes use of the latest technology. You get a 20.5GB IBM hard drive and a 32MB Hercules 3D Prophet DDR-DVI. Bonuses are the 17in CTX Trinitron monitor, eight-speed DVD and Mitsumi CD-RW. A killer price for a killer system.

Review *August 2000, p78* **Price** *£1,173.83 (£999 ex VAT)*
Contact *Atlas 07000 285 275 www.atlasplc.com*

MID-RANGE PC
Panrix
Magnum 900

Built on the Asus A7V motherboard this PC has a 900MHz Athlon, 128MB of PC133 memory, a 40GB Maxtor DiamondMax Plus hard disk and a BURN-Proof CD-RW. Its DVD is a slot loading AOpen drive, while graphics are covered by a 32MB Radeon. With video piping out to the Mitsubishi Diamond Plus 91 19in monitor this is an excellent mid-range system with Windows ME.

Review *December 2000, p75* **Price** *£1,499 (£1,275 ex VAT)*
Contact *Panrix 0112 244 4958 www.panrix.com*

HIGH-END PC
Systemax **P1000RV**
Entertainment Edn

This is an excellent PC that includes a 1GHz Pentium III, 256MB of PC133 memory, a Pioneer DVD-105, Iomega Zip CD-RW, a Creative SoundBlaster Live! Platinum, a 30.7GB Maxtor DiamondMax hard disk, Cambridge Soundworks speakers, a Hauppauge Win-TV tuner card, an ATi Radeon, a CTX PR960F monitor and more.

Review *December 2000, p181* **Price** *£2,231 (£1,899 ex VAT)*
Contact *Simply 0870 7297 366 www.simply.co.uk*

FULLY-FEATURED NOTEBOOK
IBM
Thinkpad A20P

This well-built notebook exudes quality. The Thinkpad has a mobile Pentium III 700MHz, 128MB of RAM, 16MB ATi mobility M3 graphics, 18GB hard drive, DVD, floppy and all the ports you need except FireWire. IBM's Ultrabay 2000 allows you to swap the DVD for optional extras, and the 1,400 x 1,050 TFT is a shining example of a 15in screen.

Review *November 2000, p93* **Price** *£2,888.15 (£2,458 ex VAT)*
Contact *IBM 0870 010 2512 www.pc.ibm.com/buydirect*

ULTRA-PORTABLE NOTEBOOK
Sony
Vaio PCG-Z600NE

The Z600NE has taken everything that was good about the original and made it that little bit better. It is built around a 650MHz Pentium III SpeedStep processor, which drops the speed and voltage of the CPU in order to preserve battery power. With 128MB of RAM, a 12GB hard disk, IrDA, a modem and a FireWire socket, the Vaio is both versatile and ultra-portable.

Review *October 2000, p79* **Price** *£2,399 (£2,042 ex VAT)*
Contact *Sony 08705 424 424 www.sony.co.uk*

PDA
Psion
5mx

The Psion 5mx is a quality PDA weighing 354g. It has a screen resolution of 640 x 240, a serial connector for syncing with your PC and space for upgrading with Flash memory. The keyboard is excellent and responsive, ideal for its word processing capabilities. With 16MB of memory and 15MB of Flash memory this is an ideal handheld computer.

Review *December 2000, p220* **Price** *£399.95 (£340.38 ex VAT)*
Contact *Psion 0990 143 050 www.psion.com*

DIGITAL CAMERA
### Sony
Cyber-shot DSC-S70

Sony's S70 uses the latest battery technology to provide around 120-150 minutes of usage and is Sony's first genuine 3.3megapixel camera. Image quality is superb. All in all, the S70 is the best all-round 3.3megapixel camera out there.

Review *August 2000, p97* **Price** *£750 (£638.30 ex VAT)*
Contact *Sony 0990 111 999* *www.sony.co.uk*

WEBCAM
Creative
WebCam Go Plus

With 8MB of memory and a built-in mic, the WebCam Go can also be used as a low-res handheld snapper or video camera. With excellent image quality and software you can snap up to 150 pictures in 32bit colour.

Review *October 2000, p96* **Price** *£109.28 (£99 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.europe.creative.com*

SOUND CARD
Creative Labs
SB Live! Platinum
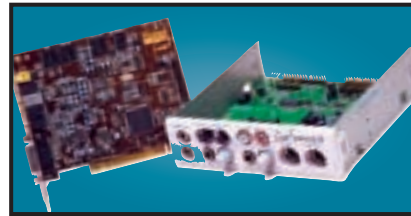
This is exactly what gamers and budding PC musicians have been asking for – great sound quality and excellent bundled software make it a winner. We think it's the best sound product ever.

Review *February 2000, p83* **Price** *£144.53 (£123 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.soundblaster.com*

COLOUR INKJET
Hewlett-Packard
DeskJet 930C

This uses the same engine as the higher spec P1100 and is a breeze to setup. Connection is via the parallel or USB interface and drivers allow you to adjust the printed page drying time.

Review *July 2000, p201* **Price** *£130.43 (£111 ex VAT)*
Contact *HP 0990 47 47 47* *www.europe.hp.com*

BUDGET LASER PRINTER
Kyocera
FS-1000

This printer is driven by a 75MHz PowerPC processor, comes with a standard 4MB of RAM and can print up to 1,200dpi. It also has an environmentally friendly re-usable toner drum.

Review *October 2000, p110* **Price** *£304.33 (£259 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.kyocera.co.uk*

COLOUR PHOTO PRINTER
Epson
Stylus Photo 870

Aimed at the professional imaging user, our test photo was beautifully rendered, there was no evidence of undesirable banding and skin tones were accurately reproduced.

Review *July 2000, p206* **Price** *£173.90 (£148 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.epson.co.uk*

BUSINESS LASER PRINTER
### Hewlett-Packard
LaserJet 4050TN

The 4050TN's 1,200dpi resolution is outstanding, and with a 133MHz NEC processor and 16MB of RAM it can turn out 16ppm. It also comes network-ready as standard.

Review *September 1999, p96* **Price** *£1,166.78 (£993 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.europe.hp.com*

MULTI-FUNCTION DEVICE
Hewlett-Packard
Office Jet G85

A scanner, photocopier and colour printer in one, that produces vibrant colours and realistic skin tones. Well suited to home or office work – and it's keenly priced.

Review *September 2000, p112* **Price** *£399.50 (£340 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.europe.hp.com*

GRAPHICS CARD
ATi
Radeon
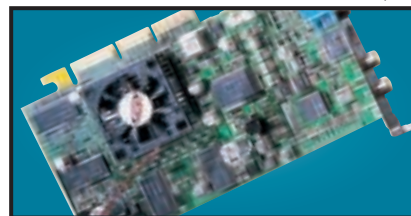
With an integrated Transform and Lighting engine, the Radeon also supports hardware environment bump mapping for lifelike surfaces and its 32bit performance is second to none.

Review *October 2000, p199* **Price** *£235 (£200 ex VAT)*
Contact *ATi 01628 533 115* *www.ati.com*

EXTERNAL STORAGE
LaCie
PocketDrive

This tiny external 6GB hard drive has two FireWire ports and a single USB connector. The FireWire ports mean the drive can be daisy chained to other FireWire peripherals.

Review *July 2000, p108* **Price** *£351.33 (£299 ex VAT)*
Contact *LaCie 020 7872 8000* *www.elacie.com*

EIDE HARD DRIVE
IBM
Deskstar 75GXP

A 75GB drive with an areal density of 11GB/ sq in. It has a spindle speed of 7,200rpm, a 2MB data buffer and an average seek time of 8.5ms. A lot of storage for the money.

Review *September 2000, p109* **Price** *£424.18 (£361 ex VAT)*
Contact *dabs.com 020 8523 4020* *www.dabs.com*

SCSI HARD DRIVE
Quantum
Atlas V

Increased areal density makes this 36GB drive impressive. It may not be as fast as 10,000rpm drives, but with seek times around 6.3ms and a spin rate of 7,200rpm, it's good value.

Review *July 2000, p100* **Price** *£528.75 (£450 ex VAT)*
Contact *Quantum 01344 353 500* *www.quantum.com*

Abit
K7T Raid

new

This motherboard has a HighPoint HPT370 controller for onboard UltraDMA100 IDE RAID for anyone who needs a lot of disk space, a fan on the Northbridge of the chipset for overclocking and an ISA slot for any older cards.

Review *December 2000, p100* **Price** *£137.48 (£117 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.dabs.com*

Asus
CUSL2

A well laid out 815E motherboard that sports six PCI slots, two CNR slots and an AGP Pro slot. The documentation is first rate and the board is simple to set up. Quite expensive, but certainly worth the money.

Review *November 2000, p219* **Price** *£138.65 (£118 ex VAT)*
Contact *dabs.com 0800 138 5204* *www.asus.com*

Ask
M3

new

This is 60 x 175 x 210 (h x w x d) and weighs in at 1.7Kg. It produces a very bright 1,000 ANSI lumen image, up to 230in diagonal that is easy to read even under fluorescent lights. With DVI and USB at the rear, it is versatile too.

Review *December 2000, p101* **Price** *£5,046.62 (£4,295 ex VAT)*
Contact *Ask-Proxima 01628 66662* *www.askproxima.com*

Iiyama
VisionMaster Pro 410

This monitor has excellent image quality and vibrant colours. With resolutions on the Natural Flat aperture-grille tube up to 1,600 x 1,200 at 75Hz this unit is an ideal 17in solution.

Review *September 2000, p192* **Price** *£276.12 (£235 ex VAT)*
Contact *Iiyama 01438 314 417* *www.iiyama.co.uk*

CTX
PR960F
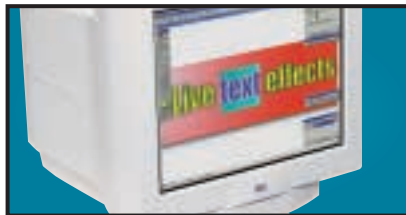
Equipped with an FD Trinitron tube this has a constant 0.24mm pitch across the screen. It also has an additional BNC input and a built-in USB hub as standard.

Review *June 2000, p91* **Price** *£374.83 (£319 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.dabs.com*

Sony
Multiscan G500

The name Sony is synonymous with high-quality displays and this 21in FD Trinitron monitor is no exception. It has dual-input connectors and remains crisp even up to 1,800 x 1,440 at 75Hz.

Review *May 2000, p226* **Price** *£911 (£775 ex VAT)*
Contact *Sony 0990 424 424* *www.sony-cp.com*

Mitac
18NE-TV

This 18in display has a native resolution of 1,280 x 1,024 and it only has a DVI connector. When connected to an appropriate graphics card, this will ensure a perfectly sized picture.

Review *November 2000, p121* **Price** *£1,643.83 (£1,399 ex VAT)*
Contact *Mitac 01952 207 300* *www.mitac-europe.com*

Panasonic
LF-D201 DVD-RAM

With a disc capacity of 4.7GB per side, compatibility with existing 2.6GB and new 4.7GB per side discs, and a versatile software bundle, this is a great product for storing large amounts of data.

Review *October 2000, p98* **Price** *£351.33 (£299 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.panasonic.co.uk*

Creative **CD-RW Blaster**
CD-Studio

This 8 x 4 x 32 EIDE CDRW package has everything you need to get started. Not only is there an EIDE cable and screws to mount the drive, but also a CD-RW disc and 10 CD-R discs.

Review *June 2000, p192* **Price** *£186.83 (£159 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.europe.creative.com*

Eicon
DIVA USB

Weighing in at 70g and no larger than a mouse, this USB ISDN TA opens up 128Kbits/sec bandwidth and supports G3 and G4 faxing as well as a variety of voicemail and file transfer facilities.

Review *March 2000, p87* **Price** *£104.57 (£89 ex VAT)*
Contact *Eicon Technology 020 8967 8000* *www.eicon.com*

OnStream
SC30

The SC30 has a 30GB compressed data capacity and using Backup Exec it achieved over 70Mbytes/min. Echo software provides drive-letter access so you can treat it like a hard drive.

Review *September 1999, p102* **Price** *£370.13 (£315 ex VAT)*
Contact *dabs.com 0800 138 5240* *www.onstream.com*

AOpen
DVD 1640 Pro

An impressive 16-speed DVD reader that includes Cyberlink's Power DVD movie player. A first-class unit that marries excellent performance with solid build quality.

Review *August 2000, p196* **Price** *£118.68 (£101 ex VAT)*
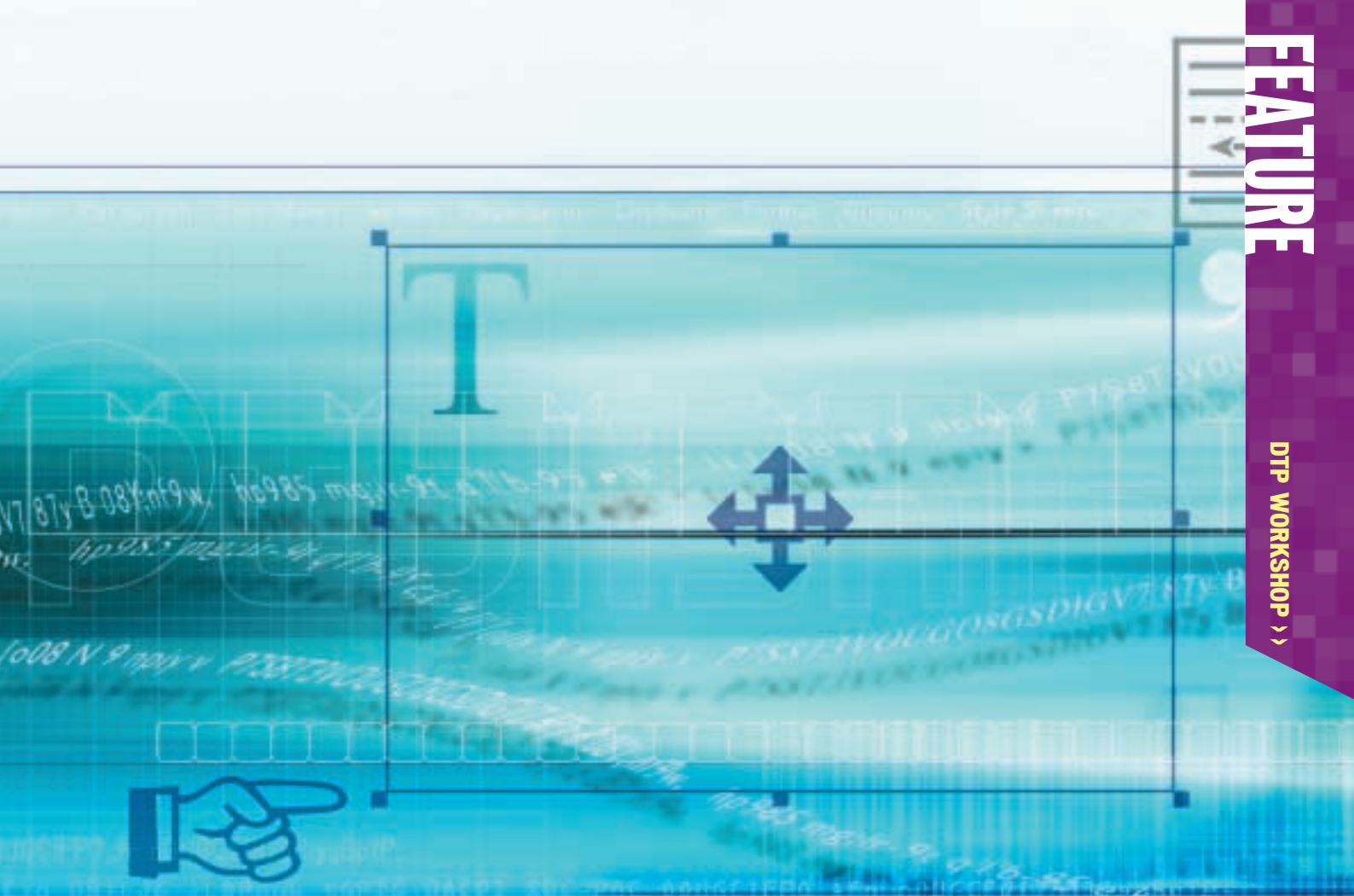**Contact** *dabs.com 0800 138 5240* *www.aopen.nl*

DTP
made easy

IF YOU HAVE TO CREATE A PUBLICATION FROM SCRATCH THESE THREE WORKSHOPS ARE ESSENTIAL READING. KEN MCMAHON GIVES SOME INVALUABLE ADVICE ON ACHIEVING THAT PROFESSIONAL RESULT

I t may be that you have been volunteered, or you're really quite into the idea of designing and producing your own publication. Either way there is an awful lot to think about. Creating an entire publication, whether it's a 300-page catalogue, a school governors' report or even just a menu, can be a big undertaking.

If you have to produce a publishing masterpiece with little or no knowledge of what's involved, the next few pages will at least introduce you to the basics of desktop publishing (DTP), help you get started and point you in the right direction for further help and advice.

There are three workshops dealing with specific aspects of DTP work. Two of the problems that non-professional DTP users often come up against concern content and presentation. How do you find interesting visual material and present what you have in an interesting and accessible way. We've tackled both of these issues by showing you how to present figures in tabular and graphic format for the maximum impact.

Home and small-business users don't have access to the same kind of photographic resources that professionals do. If your pictures are less than sparkling, but they're all you've got, cutouts are a good way of losing distracting clutter and background detail. Combined with imaginative text wraps they can make average pictures leap off the page. We show you how to make the most of cutouts and text wraps in Quark XPress and Adobe InDesign.

While knowing how to make use of an application's features is all to the good, many people faced with the task of assembling a publication are at a loss to know where to begin. They might start by scanning in some pictures, placing a few columns of text and moving things around on screen, trying to come up with something that works. Usually this means it can be read and doesn't look too ugly.

If you think this isn't true, how many times have you selected font after font from the menu, hoping to eventually hit on one that looks right? If you attempted to cook this way, you'd soon end up eating alone.

Understanding and following a few design principles will not only make your publications look a lot better, but producing them will also be much simpler, because you will have a good idea of where you are going before you start out.

ILLUSTRATION TOM GREEN

Colour – what you need to know
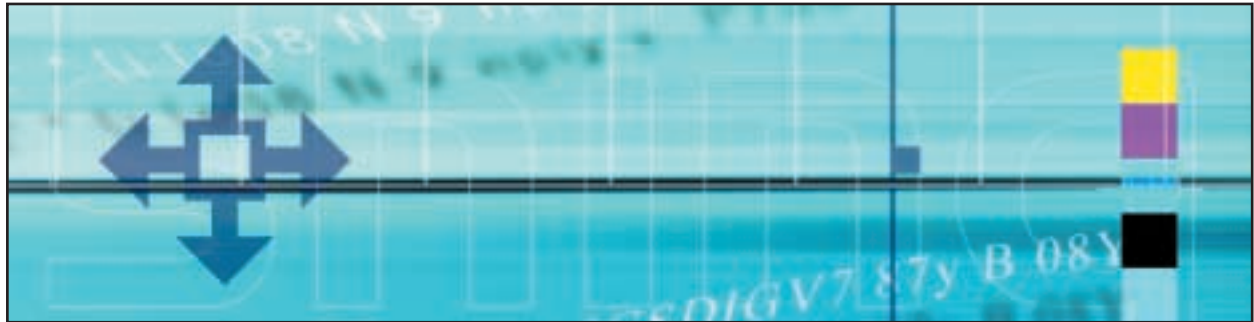
Understanding how colour printing works is very important if you want your publication to be a success. It's no good handing it all over to the printer and hoping they will sort it out, there are things you need to be aware of from the start. And one of the great things about DTP is that you have complete control over how and where you use colour.

There are two methods of printing colour that cover the majority of situations. If you want only a small amount of a single additional colour, say on a letterhead or inexpensive newsletter, this is known as spot colour. All the elements that are to appear in the second colour are printed on a spot colour film separation and a second plate is made from this which is inked with the additional colour. You may have two spot colours making three colours in all (including black).

If you want to include colour photography you need to print in four colours. This process uses four inks – the subtractive primaries cyan, magenta, yellow and black (CMYK) – to reproduce a wide range of colours. Red is produced by mixing magenta and yellow, blue by mixing cyan and magenta and a whole range of intermediate colours by mixing varying percentages of any of the four inks.

The colours are mixed using a halftone screening process – percentage tints are made by printing halftone dots of various sizes.

Differences in the way colour is produced on your monitor and between the spot and four-colour processes often lead to problems that aren't apparent until it's too late!

Scanners are RGB devices and any images you intend to print in four colours need to be converted to CMYK. Your scanner software

may be able to do this, alternatively most image-editing applications can manage RGB to CMYK conversions. If you include RGB images in your document they won't separate properly and you won't get the results you expect – most likely a composite image will print to the black plate.

Another common problem is when process colours unexpectedly print to a spot colour plate. This is usually the result of incorrectly specifying the colour, or of naming inconsistencies between applications.

What do you do if your logo is made of black and a spot colour, but you want to include it in a four-colour publication? Most applications will allow you to select a spot colour from, say, the Pantone library and convert it to CMYK, creating a close match from process colour constituents.

Grids ensure consistency

Any publication you look at is based on a grid. The grid determines the number and width of the columns, the space between them, the page margins, the position of pictures, captions, rules, page folios and every other element on the page. By following a grid you make sure that everything on the page has a consistent order.

In the dark ages, grids were printed on layout sheets or acetate so that paste-up artists would know where to stick things on the page using a toffee-like substance called cow gum. In these days of DTP you can create grids on master pages which is a lot easier.

Grids not only tell you where things go, but where they don't go as well. White space is an important, but often ignored ingredient of good layouts. Large areas of white space – above the top margin or an empty outside column, surrounding headlines and subheads – give the reader's eye a place to rest and add contrast and balance to pages. It also provides you with flexibility – you can use an empty column for picture captions, pull quotes and margin notes.

When setting up page margins, don't be afraid to be generous, to set up different inside and outside margins, use a different grid to

differentiate content (news and features for example), or even set up different size columns on the same page. Use the baseline grid feature, if your application has one, to ensure that all text is aligned across columns.

Typography confusion

There's a lot of confusion surrounding typography, even among professional designers. If you want to know the difference between a typeface and a font see last month's *pcwexpert* covering DTP.

How many typefaces should you use in your publication? Conventional wisdom says that you should use no more than two type families (all the styles and weights of a particular design) and this should suffice for most people. It may not sound like a lot, but don't forget that a single type family may contain many weights (light, book, regular, medium, bold, extra bold, heavy) all in roman and italic styles.

You can, of course, just use one type family, but this will look monotonous and formal. Adding a second creates contrast and clarity to your page. How do you know which faces go together? Generally, type is split into categories, the two most commonly used being serif and

Producing a graphic chart using Excel and CorelDraw 9
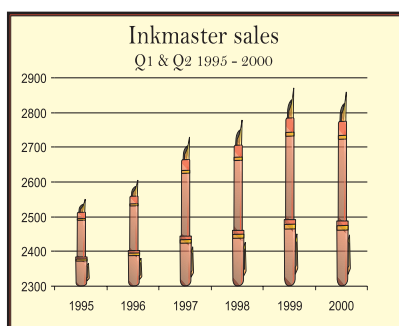
Most graphing programs offer a good range of chart types, but little control over how your graph looks – you can have 2D bars, 3D bars, stacked bars – but they're all still bars. By using Excel to produce a basic 2D chart, then importing it to a vector drawing program like Illustrator, you can make graphs much more visually appealing, replacing dull bars with more interesting and representative graphics.
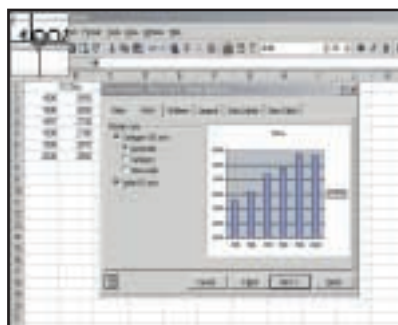
**1** Key your data into an Excel worksheet, select the relevant cells and click on the Chart Wizard button. Select the first chart on the Standard Types tab – the 2D bar chart – then click Next. You should see a single bar chart with data from the first column (year) on the horizontal axis and the second column (sales) on the vertical. Copy the chart to the pasteboard and launch CorelDraw.
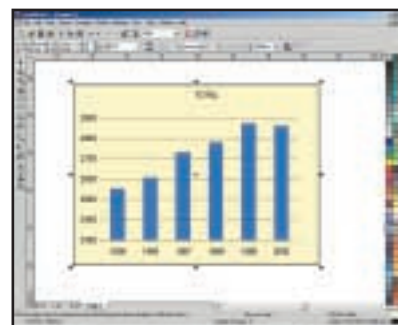

2 In CorelDraw select Paste Special from the Edit menu and paste the chart in as 'picture – metafile'. Then Ungroup All so that you can select and edit individual graph elements. As we've only got one category we've deleted the legend. The outer rule is duplicated – one exactly on top of the other – so you can delete the topmost one. We've made a few other cosmetic changes, such as deleting the grid box and adding a pale yellow background colour.
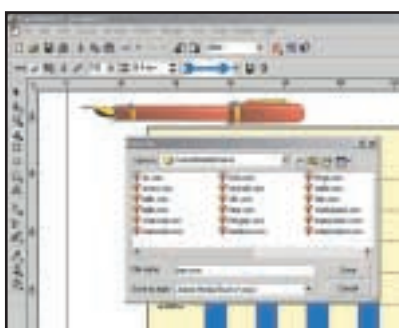
3 Bar charts can look quite dull. Our chart shows sales for a fountain pen manufacturer so we're going to liven it up by substituting a fountain pen graphic for the bars. The pen is from the Corel clip art collection. We've rotated it and scaled it down. We are going to create an artistic media brush from the pen graphic. Select the graphic and open the Curve flyout and select the Artistic Media tool, click the brush on the Property bar and click the Save icon.
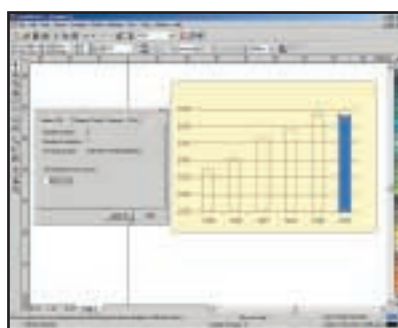
4 Right-click the first bar and uncheck and Apply Close Curve in the curve tab of the Properties dialog. Leave the dialog open and do the same for all the other bars. Then, using the shape tool, delete the top left, top right and bottom left node on each bar – leaving just a single line. Individually flip each line using the vertical flip button on the Property bar. You'll need to nudge the line over so the columns are centred between the tick marks.
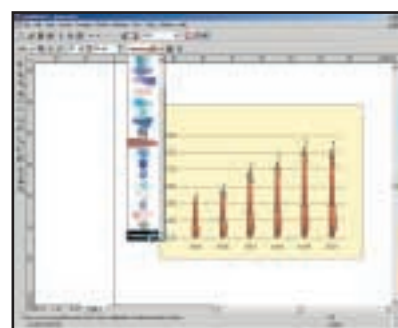
5 Shift-click using the Pick tool to select all the lines and then select the Artistic Media tool flyout and click the Brush button on the Property bar. Select your New Pen brush from the bottom of the pulldown and all those boring bars have turned into distinguished looking fountain pens. The advantage of creating and using an artistic media brush is that you can curve the path, adjust the width and apply different brushes to create new graphs from an existing template.

sans serif (you may have seen others such as script, oldstyle and slab serif). Serif type has small decorative knobs on the end of the main strokes, Times, Garamond and Paltino are serif fonts. Sans serif fonts don't have these (GCSE-standard linguists will not need to be told that sans is French for without, but in this context it is not pronounced in French, but rhymes with hands). Arial, Universe and Frutiger are sans serif fonts.

As you're looking for contrast when combining typefaces it's not a good idea to choose two serif or two sans serif faces, so choose one of each. Again, conventional wisdom states that serif faces are easier to read in body copy sizes so a serif face is often chosen for body copy and a sans face for headlines and subheads.

Choosing typefaces is only part of the job. Using type effectively on the page to draw the reader's eye to the important bits, to break up the page and add contrast so it isn't all one grey mass and to establish visual continuity is important too.
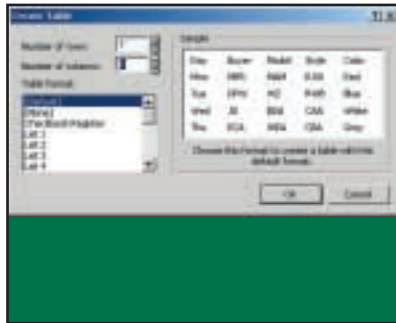
The first rule is to remember consistency. You

QUICK TIP

Set up master pages and style sheets for everything. They will help you maintain consistency, save time and make changes easier.

Using MS Publisher to create a simple table and chart

In this walkthrough we'll produce a simple table and chart in Microsoft Publisher. You often have to include numerical data in publications – annual reports, sales and marketing brochures, technical specifications and sports results are a few examples. Whether in tabular or graphical form, good presentation helps readers to make sense of the data and spot trends and patterns. First we will create an attractive and readable table, then use MS Graph to create a chart.

1 Open Publisher and choose a full page blank publication template in the catalogue. Click on the Table Frame tool. Click and drag to define the table area, then set the number and rows in the Create Table dialog box. There are a number of useful predefined table styles, we've chosen Checkbook Register because it's simple and has alternate tinted bars to make it easy to follow the rows. Either key in the data or cut and paste it from Word or Excel.

2 We've chosen Universe 10pt typeface, centred for the column headers and ranged right for data. Unbolden the headers by selecting them and clicking the B button on the formatting toolbar. The rows are white and grey, which makes them easier to read, but is a bit dull. Remove the row and column lines by drag selecting all the cells then right-click and select Change Table, Line, Border Style, More Styles. In the Border Style dialog box choose the grid preset and a line thickness of none.
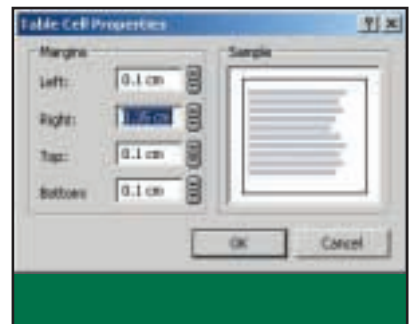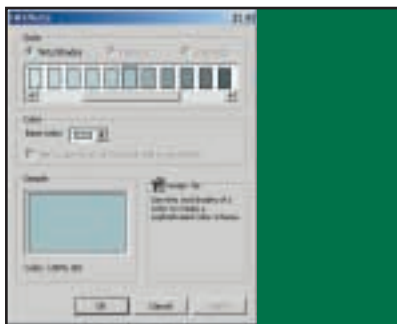
6 A lot of saturated colour can make the text difficult to read, but by using a tint of the scheme colour you can tone things down a bit. As before, click on the New button and select Fill Effects from the pulldown panel. The Tints/Shades dialog displays the 100 per cent colour with percentage tints to the left and shades – with degrees of black added – to the right. A 20-50 per cent tint of the fully saturated colour usually works well behind text.

7 Now we are going to tidy up and add a couple of finishing touches. Select the entire table by dragging across all the cells or placing the cursor in one cell and pressing Ctrl & A twice. Right-click and select Change Table, Line, Border Style, More Styles, click the box preset and select a 4pt line. We have chosen colour two from our scheme which is a darker version of one of the row colours.

8 Now you'll notice that some of the numbers are a little close to the table border. Select everything except the top row, right-click and select Change Table, Table Cell Properties and change the right margin to 0.35cm. Do the same for the dates column by clicking on the Column Select button, clicking the Cell Properties button on the formatting toolbar and making the left margin 0.35cm.

can easily establish consistent styles for the various typographic elements of your layout using style sheets. If you want to know how to do this see the style sheet workshop in last month's *pcwexpert*.

If you've decided on a sans serif face for your headlines you can also use it for crossheads, intro text and pull quotes. For example, you might use Franklin Gothic Heavy for headlines, Bold for pull quotes, and Book for crossheads. Type sizes may depend on the nature of the layout. For a

news page you'll need a variety of sizes ranging from, say, 36pt for the lead story to 18pt for less significant news. On a features page don't be afraid to use headline type as big as you can get it, but don't forget to allow plenty of white space around it. An effective technique is to mix type sizes and weight to introduce dynamic contrast.

Colour combinations

If you're looking for an easy way to create colour combinations you can find it in Microsoft
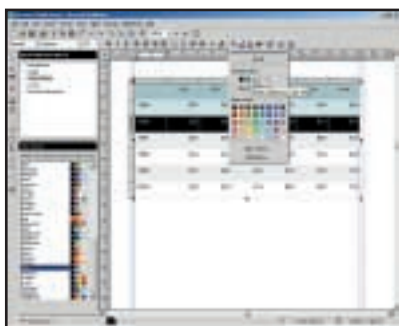
3 In the Quick Publication Wizard select Colour Scheme in the top panel and then choose one of the schemes listed below. Don't worry too much about which one, because we are going to edit it later. Click on the table, then click the panel to the left of the top row to select that row and click the Fill Bucket tool on the Formatting toolbar. The six scheme colour swatches are displayed at the top of the pulldown, click one to fill the row with that colour.
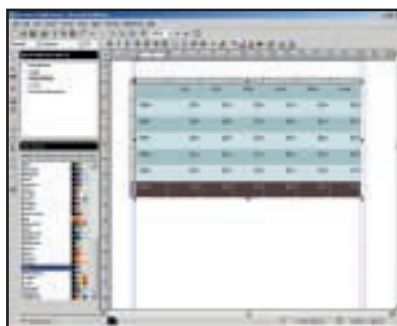
4 Select alternate rows and fill them with the same colour, then fill the other rows with another colour from the scheme. Depending on your colour scheme the table may now look hideous, but it can be changed at a stroke simply by changing or editing the colour scheme. Just click on any of the schemes in the Colour Scheme panel of the Quick Publication Wizard to see how the table looks.
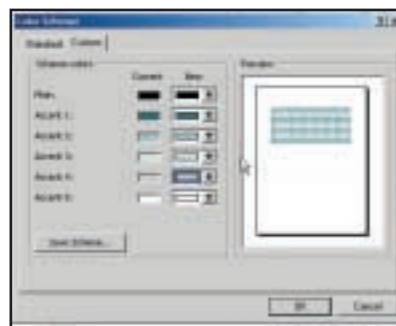
5 If you can't find a colour scheme that works you can edit an existing one. From the Format menu select Colour Scheme – the current one should be highlighted in the Available Schemes list. Click on the Custom tab and click the New button for the colour you want to change. For a different colour click More Colours and choose from the standard palette. For a wider range of colours click the All Colours radio button and select from RGB, CMYK, HSL or the Pantone Spot Colour Library.

9 One thing our table could use is a totals column. To add a column select the June column then Insert Columns from the Table menu. The new column takes its co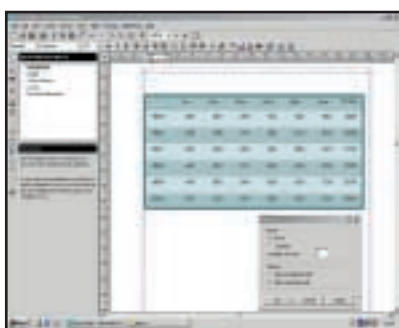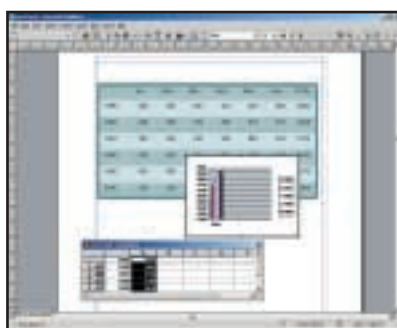lours and formatting from the existing styles so all you have to do is enter the numbers. You'll have to do the adding up yourself though. If your table is too wide, resize it by dragging the right-hand edge into the page.

10 Now for the graph. Make sure the table is deselected and select Object from the Insert menu. From the list of object types choose Microsoft Graph 2000 chart, check the Create New button and click OK. Delete the sample data and copy and paste in the year and totals columns. If the datasheet disappears when you click on the table to copy, just double-click on the chart to bring it back.
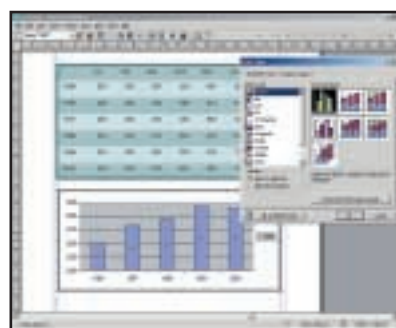
11 Click By Column on the formatting toolbar to create a bar for each year on the horizontal axis. Double-click on the axes to format them – we have changed the font to match the table and changed the scale. Next right-click on the chart, select Chart Type and choose the flat 2D style. Double-click on one of the bars to bring up the Format Data dialog box and enter an overlap value of 100 and a gap width of 60 to make the bars thicker and position them centrally between the tick marks.

Publisher's colour schemes. If you want to develop your own ideas on colour you can learn from some of them. Each scheme consists of six colour swatches. The ones that work best contain a strong saturated colour and two less saturated swatches, which are all in close proximity on the colour wheel. Then there's a contrasting colour from the opposite side of the wheel followed by a neutral swatch and black.

Generally speaking, the advice about type also applies to colour, which is to say it should be used to improve the clarity of your design. As with type, use only a few colours, two colours and the percentage tints you can produce from them provides plenty of opportunity for creative expression. If you use coloured panels behind text make them light tints so the text remains readable and whatever else you do, don't colour small type – it may look good on screen, but when printed will be fuzzy and in all likelihood it will be unreadable.

QUICK TIP

For newsletters try and put together a file of short stories and photos to use as fillers – for difficult to fill holes or in case something you were expecting doesn't turn up!

Creating cutouts and running text around them

Cutouts – removing background detail from pictures so the subject stands out – create exciting pages. Most image-editing applications have specialised tools to help you do this, but the cutout is only 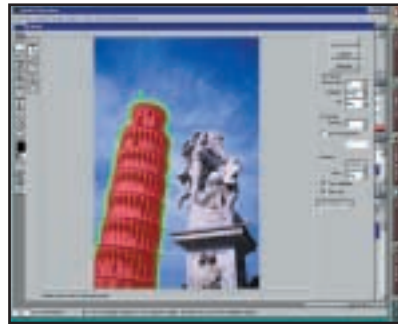half the story. Quark XPress and Adobe InDesign provide excellent tools for making text flow around irregular images. In this workshop we'll show you how to get the most from Photoshop and PhotoDeluxe with images, and Xpress and InDesign with text.


1 Photoshop's Extract command is a quick and simple way of separating an object from its background. Press Alt & Ctrl & x to bring up the Extract Image dialog then use the edge highlighter tool to mark the edges of the main subject. Make sure all the edge detail is covered – change the brush size if necessary. When the subject is highlighted all the way round (you don't need to worry if it meets the edge of the canvas) click on it using the Fill tool and click Preview. Click OK.

2 In PhotoDeluxe 3, open the image and click on the Get and Fix photo tab. Select Special Effects, Collage, Background Effects. Use the edge-hugging Smart Select tool to draw around the subject, clicking at short intervals to create anchor points. When you've gone all the way round and the pointer changes to OK, click to close the path and click on the Delete Background button. Zoom in to clear up any messy edge detail with the eraser.

6 Instead we'll make the clipping path in Photoshop. This time, use the Magic Wand tool to select the building. We've set the tolerance quite high – at 128 because there's a high contrast edge between the building and sky. Select Make Work Path from the Paths palette using the default tolerance setting of 2.0 pixels and save the path. Then save the image as an eps file and place it in a Quark picture box.
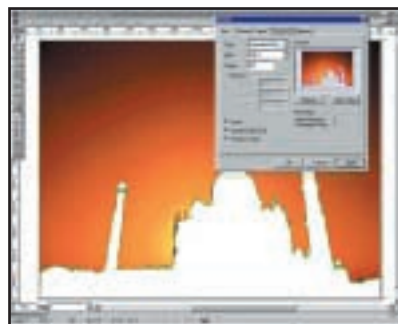
7 With the picture selected press Ctrl & m to bring up the Modify dialog box and in the Clipping tab select Embedded Path in the Type pulldown menu. XPress is using the Photoshop path as a clipping path. Check the Invert box and in the preview thumbnail you can see that the clipping path has switched to reveal the sky detail and suppress the building. Next click the Runaround tab and choose Same as Clipping from the Type pulldown menu. Click OK to apply the changes.
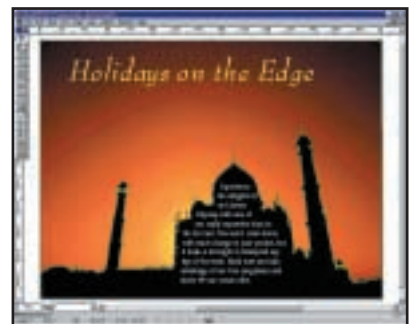
8 Next create a text box and key in or Get Text (Ctrl & e). Press F12 to show the colours palette and make the text white and the box background black. Make the box big enough to cover the part of the image that it's going to fit behind and then send it to the back. The selection on which our Photoshop path was based was a bit inaccurate, so some of the detail is still present and this works quite well. But if you want to, you can edit the clipping path by pressing Ctrl & Shift & F10.

Printing

If you are intending to print your publication on a colour inkjet for distribution to the members of the local residents' committee (membership three) it's worth taking a few steps to ensure that you get the best-quality reproduction. With an inkjet you at least have the advantage of being able to make changes if the first copy doesn't look quite right.

Avoid using large blocks of heavy colour that, quite apart from draining your cartridge in next to no time, may streak. Be careful about graduated fills over small areas which may print as distinct bands or steps rather than as a smooth gradation.

Make sure your printer driver options are correctly set so that you get the best output for the type of paper you are using. Most drivers provide options for setting print resolutions for both plain and specialist paper produced by the printer manufacturers.

Don't forget that on an A4 printer, you can't print up to the edge of the paper and may need at

3 Create a picture box in Xpress and get picture (Ctrl & e). The default runaround on picture boxes is Item – the text runs around the box rather than its contents. Press Ctrl & m to bring up the picture box Modify tabbed dialog box. Click on the Runaround tab and select Auto Image. The outset is the gap between the edge of the image and the text – set this to at least 4pt. Click Apply and the text will follow the edge contour of the image.

4 If you uncheck Restrict To Box the image is not confined by the picture box boundaries. Here we've given the box a linear blend background and resized it to occupy the left-hand column only while the image has remained exactly where it was.

5 Here we want to remove the foreground image, keep the sky detail and turn the building into a silhouette. Create a clipping path for images in the clipping tab of the Modify dialog box by selecting non-white areas in the Type pulldown and adjusting the threshold setting to remove unwanted detail. This works well where there is good contrast between the foreground subject and background. Our sunset is dark in places so it is hard to select the building without bits of sky.
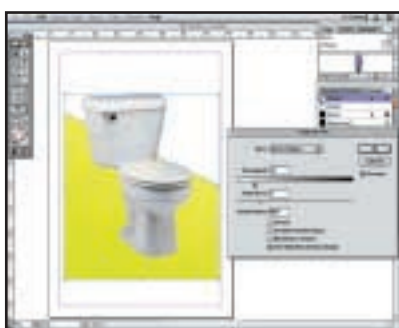
9 Though it's generally much more flexible with graphics, InDesign doesn't fare much better than XPress when it comes to creating clipping paths for images that don't already have them. Unless the image is on a light background it's almost impossible to separate the foreground from the background, even if it's a fairly flat contrasting colour as in this toilet picture. What you can do, though, is create a manual path using the pen tool and paste the image inside it.

10 With an embedded clipping path in the Photoshop image, creating cutouts and runarounds in InDesign is simple with the Text Wrap palette. Use Object/Text wrap to display the palette and click on the middle button to wrap text around the object. Enter the offset in the top offset field. Edit the wrap boundary with the Direct Selection tool. We've used the Delete Anchor Point variant of the pen tool to reshape the path to prevent text from wrapping down the left-hand side.

11 Here's another InDesign trick that's quite useful. Click the Invert button on the Text Wrap palette and the text flows inside the wrap path rather than outside it. With the right choice of picture, perhaps 'knocked back' to lighten the shadow areas and make text more readable, you can easily create interesting graphic boxouts.

least a 15mm margin on the bottom edge. 'Bleed' edges – where elements run right up to the edge of the page can only be produced by hanging elements off the page edge, printing on a larger format printer and then trimming out the pages with a guillotine or scalpel. And if your publication has more than one page set it up as 'printers' pairs'. For a four-page A5 publication the back and front pages would be one spread and the inside pages another.

Now you know the basics you'll hopefully find producing your own publication a less daunting prospect. Of course, there's nothing new under the sun and the best source of design ideas is often someone else's work. There's no shortage of sources for interesting layout ideas from newspaper colour supplements, magazines and even junk mail. Every time you see a layout you like, or hate, try to work out why, cut it out and keep a file for when you're stuck for an idea. If it worked for someone else, there's a good chance it will work for you.

QUICK TIP

Borrow ideas from other publications – magazines, mailshots, stationery, even packaging are all good sources. You'll find the results are much better than templates.

DEATH
OF
PAPER?

WITH AUTHORS RELEASING NEW WORK ON THE
INTERNET AND THE ARRIVAL OF THE EBOOK,
ELECTRONIC PUBLISHING HAS FINALLY COME OF
AGE. RICHARD MCPARTLAND LOOKS AT THE
FUTURE PROSPECTS FOR THE PRINTED WORD

I f the so-called experts are to be believed we're sitting on the cusp
of an information revolution, the like of which hasn't been seen for
5,000 years. We're promised this breakthrough will quite literally
rewrite the book. What is this great invention that promises to grip
the nation? It's none other than the electronic or ebook.

The ebook has long been talked about, but what chance does it stand of
changing the world when paper does the job so well? Surprisingly, more than
you may think. Big-name authors and manufacturers are finally starting
to get behind the concept and electronic 'paper' is now becoming a reality.

Earlier this year, horror writer Stephen King decided to publish his
novel *Riding the Bullet* exclusively on the Internet. If King could successfully
cut out the middlemen he stood to reap huge financial rewards and the
decision to publish electronically sent shockwaves through an industry
said to be worth around £48b.

On balance, the gamble paid off. Within the first 24 hours of the novel
being published, etailer Barnes and Noble received more than 200,000
requests for the title at around £1.60 a pop. In effect, B&N was shifting
2.5 copies of the novel every second. It was a major wake-up call for
epublishing sceptics.

'In the first few hours after release it was estimated that two million
people tried to download it across a number of sites. Nobody could have
predicted just how popular it would be,' said Sarah Miller of Barnes and
Noble. 'It took all of us by surprise and proves that the possibilities for this
kind of technology are immense.'

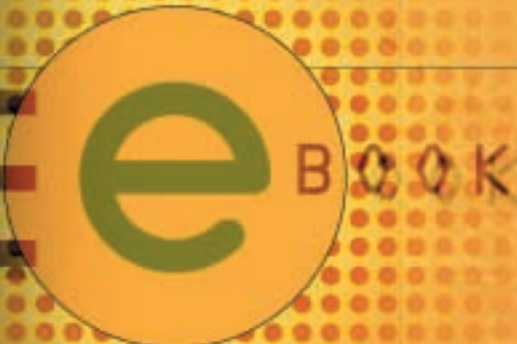However, King's experiment didn't run entirely to plan. Within hours

ILLUSTRATION CARLTON HUTCHINSON

The Pocket PC platform is equipped with Microsoft Reader, enabling users of the device to download and read ebooks

of the novel being uploaded it was being offered around the web for free. People were obviously hungry for electronic books, but it seemed it would be impossible to make big money without some form of digital rights management or copy protection.

Seemingly unperturbed, King hit the headlines again when he announced his latest title, *The Plant*, would be uploaded to his website in bite-sized chunks in June this year. King promised to upload two chunks of the novel and asked people to pay $1 for each portion. Unless 75 per cent of those who downloaded the chunks stumped up the cash, the third installment would never see the light of day. Encouragingly, people seem to be doing the right thing and at the time of writing, 76 per cent of those who downloaded the novel have paid up and many have paid extra to cover those who haven't, according to King's publicist Marsha DeFilippo.

Although downloads currently stand at 152,132 (significantly down on *Riding the Bullet)*, King is pleased with the results. It's hardly surprising. Online sales are said to have netted King around £625,000 before costs. 'If we've proved nothing else, we've proved that the guy who shops for entertainment on the net can be as honest as the one in a retail bricks-and-mortar store,' he said.

The success of the experiment so far is due in no small part to King's legion of loyal fans, but the concept of electronic books has a long way to go before it becomes mainstream. However, popular authors like Michael Crichton and Frederick Forsyth

Microsoft Reader software can be dounloaded onto your PC from the web
www.microsoft.com/reader/default.htm

are now getting involved and online ebook stores such as ebook.com have joined the usual suspects like Barnes and Noble. Microsoft has also announced it is to partner with Amazon to sell titles in Microsoft Reader format in the near future.

So, what's prompted this renewed interest in electronic publishing? The answer is twofold. First, the growth of the PDA market, aimed at people who need to work on the go, has also kickstarted the idea of electronic entertainment on the move. Electronic books make sense and it's both possible and practical to carry a library of titles on a palm-sized device. The second answer is one of cutting costs. The print and distribute model is rapidly changing to one of distribute and (maybe) print, thanks to the growth of the Internet. Why bother to print at all when you could keep your book in electronic format all the way down the distribution chain?

The concept undoubtedly has its advantages, but even the most ardent proponent of electronic publishing would be foolish to write off paper just yet. Although there's little to distinguish ebooks from the printed word, the fact remains that long texts, such as books, are a lot harder to read on a screen than on paper. That could explain why publishing companies like Penguin don't seem overly worried.

Mark Williams of Penguin Publishing said: 'There's no reason that electronic and print formats can't exist in tandem. Even if books in electronic format take off, buying a printed copy of a favourite book will always be popular. People like books. Simple as that.'

Unsurprisingly, the computer industry is investing heavily in its attempts to solve some of the failings of electronic books with new software, hardware and even electronic paper to tackle traditional publishers head on.

Software solutions are already plentiful although, admittedly, they are still in their infancy. Adobe's pdf format is one way of distributing printed documents while retaining their formatting. There are also dedicated programs available for reading electronic books on desktop and portable PCs. The Glassbook Reader, from the company of the same name, is designed for use on desktop PCs and has been around for a while now. It claims to offer a 'paper-like' display on a conventional screen. Adobe has obviously seen the product's potential – it has just reached an agreement to buy the company.

Mark Walter, ebook analyst and editor of the *Seybold Report on Internet Publishing* believes it's a good move for Adobe. 'Glassbook is a significant player in the ebook
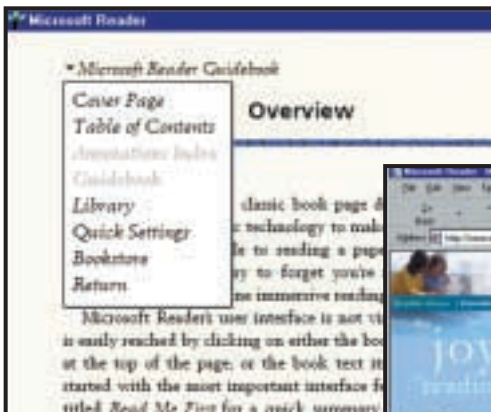
arena. This acquisition really strengthens Adobe's ebook initiative and gives it a stronger story for the publishing community,' he said.

Microsoft has recently produced similar software, designed to give a paper-like quality to on-screen text by optimising characters for on-screen viewing. This technology, known as Cleartype, lies at the heart of Microsoft Reader, which debuted on the Pocket PC platform back in February and has now been launched for desktop systems. Unfortunately, it doesn't support books in the Glassbook format.

Cleartype is much more than just anti-aliasing. One of the co-inventors of the technology, Bill Hill, explains that the development of the software was based on the findings of a study as to how letters and words appear on a printed page. The reader program then recreates these images on screen. 'In effect, it fixes the problem of word recognition,' he said.

Hill hit upon the idea behind the system while animal tracking in the US. 'Animal tracking is a bit like reading. If you recognise the pattern it's easy. But if it isn't clear enough or sharp enough you have to work it out.'

He believes the impact of Cleartype and similar technology will have as dramatic a social impact as the dawn of the first printing press. 'The move towards screen-readable information will change society just as much as the invention of the printing press but it will do it in five years rather than 500,' he said.

Hill's hyperbole may be stretching the point a little. Even he admits more has to be done before people are willing to read an entire book on screen. 'The book is a complex type of technology. In fact, it is the most mature information interface that we have and in order to understand how it works we have to do a lot more,' he said.

Making text more comfortable to read is one thing – making it more portable is another stumbling block en route to the mass market. Early attempts have been a touch limited. The Rocket Book Reader is a device dedicated solely to reading electronic Glassbooks while on the move, but sales have been a little slow. Not surprising really as a price tag of around £170 for a device that does nothing other than allow you to read a book seems a little steep. The success of the latest version of Windows CE for Pocket PCs (which incorporates Microsoft Reader) has helped somewhat, but even the greatest advocates of electronic books argue that these existing approaches are primitive.

'Electronic book devices that you can buy right now, such as the Rocket Book, are still,

The Glassbook Reader's on-screen display simulates the look and feel of a printed book

from a technological point of view, using existing technology. It is basically just a laptop computer with a standard display,' said Pierre Wiltzius, technical manager for Lucent and Bell Labs. So, is there really an alternative to the computer screens and PDA devices we've grown so used to? It would appear so. Manufacturers are already hard at work inventing different kinds of 'electronic paper'.

Xerox's solution, the Gyricon, looks and feels like paper but has all the qualities of a computer screen. It allows you to download electronic content and can be rolled up to fit in your pocket. Although it sounds like science fiction it's already been produced by the company's Palo Alto Research Centre (Parc), ironically, the same division that brought us the laser printer (see also *pcwexpert* October).

The Gyricon is basically a thin sheet of plastic made up of millions of tiny beads, a bit like the toner particles found in laser printers. The beads are double-sided, one side is black and one white. Each bead fits loosely into its own oil-filled cavity and can freely rotate. When a small current is passed through the Gyricon the beads rotate to show either black or white and thus form patterns, words and pictures. Plans for a tube-shaped device that acts as a combined printer, copier, fax and scanner are also on the drawing board.

Lucent and Bell Labs are also working on their own 'electronic paper'. The company's goal is to replace the expensive silicon-based technology used in the Rocket Book with a plastic that it says will look and feel like paper.

'Our goal is to make a paper-like film that is as flexible and easy to read as ink on paper,' said

Fans can download Installment 1 and 2 of The Plant *by logging on to the official Stephen King website (*www.stephenking.com*)*

Wiltzius. It's hoped this plastic will be 100 times cheaper than readers based on silicon chips.

The paper is designed to work with a special E-Ink invented by a US company of the same name. The ink is a coloured liquid made up of millions of microcapsules. Each microcapsule has a clear outer surface and is filled with a blue dye and microscopic chips of white pigment, which carry a positive charge. The ink is sandwiched between two transparent conductive sheets and the white pigment is made to rise or fall by electronic charges, creating blue or white dots that can be formed into letters and pictures.

Both E-Ink and Lucent and Bell Labs believe their solution will overcome previous cynicism about electronic replacements for paper. 'The reality is that if people had wanted to read novels on screen they could have done it 10 years ago,' said Russ Wilcox, vice-president and general manager of E-Ink. 'Re-education and electronic paper is what is needed.'

Although tabloid or book-sized versions are not yet available, Immedia boards based on E-Ink's technology have been on trial in high-street shops in the US for some time. They could be on widespread display early next year.

The question remains, is there a mass market for electronic paper? Nick Sheriden, developer of Gyricon believes so. 'There's been a large amount of interest from the newspaper publishing companies to find alternative methods of publishing. There's a lot of cost in print and distribution.'

Electronic papers and inks are only the beginning. A company called Anoto is aiming to breathe fresh life into one of the world's oldest communications mediums – the pen and ink.

Imagine an interactive order form printed on a special paper which has a series of small dots imprinted on the page. These are set out in a grid which expresses a set of X and Y co-ordinates. The pen works by recording the letters and words formed with a tiny digital camera that can be found in the tip of the pen. Images are then processed by a dedicated processor.

The next step is to transfer these images, which make up your order, to the outside world. This is done using a transceiver and an Internet phone both equipped with the Bluetooth wireless technology. Once the information has been transferred to the phone it is sent out to Anoto's gateway to the Internet then on the retailer. They'll receive an exact copy of your order delivered straight to their PC.

It may sound far fetched, but tomorrow's

world could come sooner than you think: the company already has working prototypes of the technology, and is planning to launch the paper and pen next year. However, it will cost slightly more than your average ball-point pen with an expected price tag of around £60.

So, what of the future of paper? Well, although a successful 5,000-year-old technology will not be replaced overnight, electronic alternatives are just around the corner. As Xerox's Sheriden said: 'This is something that is going to happen, and if the right people get involved it could happen within three years.'

Sheriden's estimate seems a little optimistic. It will undoubtedly take a few generations worth of improvements before the technology becomes commonplace, let alone mainstream. Existing electronic papers are strictly two-colour with very slow refresh rates, although experts predict coloured displays and papers capable of displaying moving images are possible in the not too distant future.

E-Ink is made up of millions of dye-filled microcapsules and charged, microscopic chips of white pigment

Even with the technology in place, another problem needs to be addressed before the wider publishing community hitches itself to the epublishing bandwagon. As with MP3 music, copyright concerns have stemmed the number of publishers and authors willing to jump into electronic waters. However, that could change now Microsoft has implemented its Digital Rights Management (DRM) system in the recently launched desktop version of the Reader software. This does mean that 'latest version' copyright protected books are incompatible with Reader on the Pocket PC platform, although a new version is expected eventually.

Jason Dunn, who runs his own Windows CE website (**http://windowsce.kensai.com**) explained: 'Implementing the highest level of copy protection for Pocket PC is a very significant effort, so availability of this upgrade will be in months, not weeks.'

Even with the thorny issue of copyright protection solved, it'd be a foolish man who wagers on a paperless world in 10, 20 or even 100 years' time. It'd be equally foolish to underestimate the fact that there has been a significant shift in the way people are using paper. Thanks to the growing popularity of the Internet, models of information consumption and distribution are changing – and changing fast. The ebook concept is just the tip of a very big iceberg and one that could, theoretically, change the way we consume information forever.

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EVER CONSIDERED TURNING YOUR HOBBY INTO A CAREER? IF YOU SPEND YOUR SPARE TIME GLUED TO YOUR SCREEN, SORTING YOUR SOFTWARE OR TWEAKING YOUR HARD DRIVE, WHY NOT GET QUALIFIED AND MAKE A LIVING OUT OF IT, SAYS GUY MATTHEWS

If you are a regular reader of this magazine, then you probably find computers fun. There's a good chance that you regularly spend several hours a week at home on your PC, perhaps writing your own software programs, playing with HTML or even tinkering around inside to overclock your processor.

Having computing as a hobby gives you an edge over stamp collectors and brass rubbers. Apart from being a whole lot more interesting, it can potentially be turned into gainful employment.

There are plenty of professions out there for which demand is in recession. But the world has not got anything like enough IT professionals. This means that by achieving the right qualifications, you could convert what you do for fun into a career, and be in hot demand for well-paid work.

Such is the current shortage of professional IT skills that a move into some sort of technology-based career is perfectly possible if you are a recent school leaver, a twenty- or thirtysomething contemplating a career change, or an older person looking for a fresh start.

The number of IT services jobs in the UK jumped 38 per cent last year to 500,000, according to the Government-sponsored National Training Organisation (NTO) for ebusiness. This does not, it should be noted, mean people who use computers as part of their job, but those who are paid for their knowledge of IT.

At the current rate of growth, an extra 800,000 people will be needed to work in IT services by 2003. At the moment, nobody is quite sure where these extra people are going to come from.

As a nation, we are simply not generating enough people to fill the number of computing jobs that industry is creating. This is partly because IT education is a little behind the times and has not reacted quickly enough to things like the huge growth in commercial Internet usage.

It's also because many young people think IT is for nerds, and they want to be the next David Beckham or Davina McCall instead.

This is a shame because IT is a great route into all sorts of branches of work, from the armed services and agriculture to manufacturing,

construction, engineering, retailing and transport. You don't, generally, get your hands dirty and you don't have to be a particular class, race, age or sex to get ahead in the industry.

Employers are not looking for the next Steven Hawking or Clive Sinclair, just intelligent, motivated people to work in, for example, customer support roles like running software helpdesks and maintaining hardware. Or you might prefer something more 'back office', like checking software code or website design, or perhaps something more technical like porting legacy applications to Linux.

It does help to offer a little more than raw enthusiasm to a prospective employer. Some sort of IT-related qualification is going to add weight to what you've picked up from messing around on your PC on a Sunday afternoon.

How then can you get the qualifications you need to make a start in an IT career?

If you are still at school, there are plenty of academic routes into IT, from GCSEs and A-Levels to full three-year degree courses. But let's assume for the purposes of this article that you're either no longer in school, or that you want training that's a little more practical and less theoretical than you'll get from the ivory towers of academia.

IT qualifications that prepare you for a job fall under two rough headings: vocational qualifications that are generally independent of any particular manufacturer's product line, and professional certification from computer software or hardware companies, which is self-evidently more specialised.

The downside of a vocational qualification is that it can render you a bit of a jack-of-all-trades with no demonstrable forté. The downside of vendor certification is that you are, to a degree, dependent on one company's or even one product's continued success, and you will need to constantly retrain and update your skills as new versions of that company's products roll off ever speedier production lines.

The most obvious and basic of available vocational qualifications is the National Vocational Qualification (NVQ). If you are still at school or studying at a college of higher education, this will most likely be offered in the form of a General National Vocational Qualification (GNVQ).

There are GNVQs in information

technology at three levels: foundation (for beginners), intermediate (equivalent to four GCSEs) and advanced (equivalent to two A Levels). Like all NVQ qualifications, they are not dependent on exams. Instead, students are assessed through projects and assignments, and may well be put through some work experience.

Anne Coquin of the eskills NTO, a newly formed body that tries to encourage both employers and potential employees to take the training route, said: 'If you are taking your NVQ while in work, your assessor can be your boss.'

This may, of course, be good or bad news, depending on your relationship with those above you. It does at least reinforce the point that an NVQ is a thoroughly practical and work-oriented way forward, as well as one where it is hard to fail, so long as you are reasonably motivated.

An advanced GNVQ, which will take your last two years of school to achieve, will then qualify you for the next level of vocational qualification, the Higher National Certificate (HNC). The HNC is a kind of middle ground between work and study because, although some of your work towards it is college-based, the experience of work from your job is also taken into account. The course is usually done part-time, perhaps taking one day and a few evenings a week, so that you can work and study at the same time. The time it takes depends on the time you have available, which in turn is dependent on the indulgence of your employer, but it typically takes two years.

There's a good choice of IT-related HNCs provided by colleges of further education and higher education, and by some universities.

Another comparable vocational qualification is the Higher National Diploma (HND), a full-time version of the HNC. The qualification emphasises practical approaches to learning, including project and assignment work, team and group work, as well as research into real business practice.

If you are not exactly a fresh-faced teenager any more, the NVQ door is still wide open, although the HNC and HND courses might be a little trickier to negotiate your way onto. NVQs, awarded by bodies like City and Guilds, are available to anyone at any age or stage in their career. They can be studied full or part-time at a range of institutions, or even at a weekly evening adult education course.

They are well suited to people in work as they are split into units you can tackle at your own pace that are assessed as you go along. You can also choose just to work on particular units that fit what you need to learn at a certain time.

An alternative aimed at younger people who have left school and are in employment is the National Traineeship. This is a work-based training programme leading at least to NVQ level 2. Most National Trainees are employed

Route to web skills

This time last year, north London-based Sami El Titi, 22, was working as a graphic designer. Now he is a webmaster with a company in the fast-moving telecommunications sector. 'I was using Photoshop and Illustrator and that kind of thing in my old job, but I knew from talking to friends that web design was where I wanted to be,' he said. 'It seemed like a natural progression from what I was doing.'

On his iMac at home, Sami had been able to learn useful bits and pieces in his spare time, but with a busy job that couldn't give him the training he wanted, the problem was always going to be finding time to take things to the next stage. And like most people in their early twenties, Sami didn't have the kind of cash to pay for a course to give him the skills he needed.

As luck would have it, a friend spotted a vacancy for a webmaster with Laxis, a Clerkenwell-based company that is building a European fibre-optic network. Although he could offer no qualifications, he was able to convince Laxis that he would be worth hiring and sending on the right training courses.

He was sent to Harlequin Solutions in west London to do four two-day courses: an introductory one for HTML and for Dreamweaver, and an introductory and intermediate course in Flash design. He said: 'The courses cost Laxis about £1,600, which is not much for them, but a lot more than I could afford on my own. They were great courses, with no more than eight people per class, and I am free to email my tutor with any queries I might have. From my point of view, a classroom is better than doing it on your own with a CD-ROM or on the web, because you can get quick answers to any questions.'

Some companies will pay for courses to upgrade employees' IT skills

and paid a wage while they train. You will generally be expected to be between 16 and 19.

For those between 16 and 24, there is the Modern Apprenticeship, a work-based training programme leading to NVQ level 3. Like the National Traineeship, you work while you train.

The Modern Apprenticeships in computing come in three main flavours: Using IT, Operating, Installing and Supporting IT Systems and Developing IT Systems.

The other type of work-oriented qualification is the manufacturer certification discussed earlier. A large proportion of such training is aimed at taking experienced IT professionals onto a higher level. If you want to be a Certified Novell Engineer, for example, then you won't find the considerable trouble and expense of a qualifying course worth the bother unless you already have a passing acquaintance with Novell NetWare, which you almost certainly won't if you're only used to a standalone PC. Leave this kind of thing for the pros, or at least until later in your career.

There are some professional certifications that ought to be well within the reach of any trainee with aptitude and the right attitude. One of the most popular for those at the start of their IT career is Microsoft Certified Professional (MCP). You can choose from a number of Microsoft products to base your MCP qualification on, from NT4 (shortly to be discontinued), Exchange or SQL Server.

Daniel Morgan, product manager with QA Training, one of the UK's largest IT training companies, corrects a commonly held assumption: 'All these professional qualifications are owned and administered by the manufacturer in question. We, like all training companies, run courses that will prepare you for the exam, which you will sit with a specialist testing body approved by the vendor. As with any syllabus, we cannot offer 100 per cent preparation, and extra reading is needed.'

Morgan says that for those not ready to deal with the complexities of Microsoft Exchange, QA, like most other training specialists, offer foundation courses that may not give you an 'open sesame' certificate, but provide a grounding in the basics, such as Microsoft Office and desktop Windows versions.

The globally recognised A+ qualification is rapidly gaining currency among employers, and is being offered by a widening range of training companies. Chris Screeton, vendor development manager with Spring Training, said: 'It is a good generic qualification, not tied to any platform or manufacturer, but it is well put together, covering hardware, software and networking equally, and it is starting to be taken seriously.'

A little more in depth than a foundation or A+ and some way ahead of MCP are courses that prepare you to sit for the esteemed title of Microsoft Certified System Engineer (MCSE), or Microsoft Certified System Developer (MCSD). There are also comparable courses for other vendors, such as Certified Lotus Professional (CLP) and Accredited Compaq Technician (ACT).

Redundancy opens doors to an IT career

Dean Smith, 35, worked for many years in the photocopying department of a large BT office before redundancy forced him to make a career change. He recalled 'When I was offered redundancy in the mid-1990s, part of the package was money for retraining. I had always had an interest in computers, so that seemed like the best direction to go in.'

Dean booked himself onto a six-week long residential course with Cerco, a small training company based in Cheshire, for a cost of £3,000. 'It was pretty demanding stuff,' he recalled. 'We were at it from nine to five every day, with exams at the end of each week. By the end I was a fully qualified hardware engineer.'

Inevitably, large parts of what was learned in those weeks has not been of use since, he said. 'We covered some extremely technical stuff that you really wouldn't ever use in the field. But I learned how to take a PC apart and put it together again, and diagnose most types of fault.'

The result of the course was a City and Guilds certificate in Microprocessor Systems. Employment followed swiftly – in fact, with Cerco's help, Dean took only four days to land a job with Chippenham-based Matrix, a computer maintenance company. He said: 'The work was a bit boring, to be honest. But I have since moved to a different company where I am training in Microsoft NT4 and Windows 2000. I'm now supporting a range of systems – it's a lot more fulfilling than photocopying!'

Microsoft, for its part, is trying the raise the bar for its MCSE and MCSD qualification, to ensure that they are truly respected as a benchmark by which employers judge holders. This is great news for those who make the grade, and a warning for those who are preparing their first foothold on such a ladder.

Morgan of QA Training said: 'Microsoft wants getting certified to be proof to your boss that they've got a return on their investment. There are benefits of all sorts to you too – you get invitations to exclusive Microsoft events, and access to all sorts of useful technical information.'

Some of the more disingenuous training companies may give the impression that a professional certification is a meal ticket for life. Gillian Brand, marketing manager with Learning Tree, another large and well-established training company, said: 'I often get asked by students "Will Microsoft certification guarantee me a job?" and I feel very uncomfortable about saying an unqualified yes. There's never a simple answer when you're talking about the future of someone's life.'

One of the issues of both vocational training and professional certification is its high cost. Cheap training is not usually good training. 'You get what you pay for' never rings truer than when talking about the best way to get qualifications that will impress employers.

It's not just down to what it says at the top of the certificate at the end of the course. A snob might tell you that a degree in computer science is worth all the NVQs in the world, and a Microsoft-certified engineer will tell you there's no better respected qualification among employers. But in truth, any mainstream qualification should be enough to get you noticed in the job market, and there should really be no place for one-upmanship.

What the course is about is more important. You might prefer to major in well-established programming languages and mainframe maintenance, and go to work for a Swiss bank. But it's more likely that you'll be better off, and more stimulated, choosing where future growth lies. Reading magazines like *Personal Computer World* will steer you towards the sort of hot technologies and skills for which employers will pay top whack.

But beware hidden traps. Last year was a boom for those with legacy application skills, as big companies fell over their cheque books to get ready for the Millennium Bug. This year, nobody is paying big money for that sort of knowledge.

And you can be too hip as well as too fogeyish. It might look for all the world right now that a WAP programming qualification would be hotter than a chilli pepper. But if WAP flops or is superseded, and it might be by the time you're qualified, then it's back to school.

The route you choose to get your qualification is critical, as this will determine your chance of achieving it. If you are paying for your own course, the expense of a full-time course with a dedicated training company might tempt you to enrol in a local evening class and battle through the hard way. This is like saving money on a ferry by rowing across the Channel. Only the most resolute will make it to the other side.

A reputable training company, preferably one that specialises in IT, is a better bet. They will all have a choice of full-time and part-time courses in subjects from the most technical to the more business and management-led, and in old-school technologies like Cobol and C++ to hip ones in Java, Corba and Dynamic HTML.

Unless you live in Notting Hill on daddy's trust fund, you'll find it easier to meet the cost of these courses if you can persuade your existing employer that they really ought to be paying for your education in web design, even if
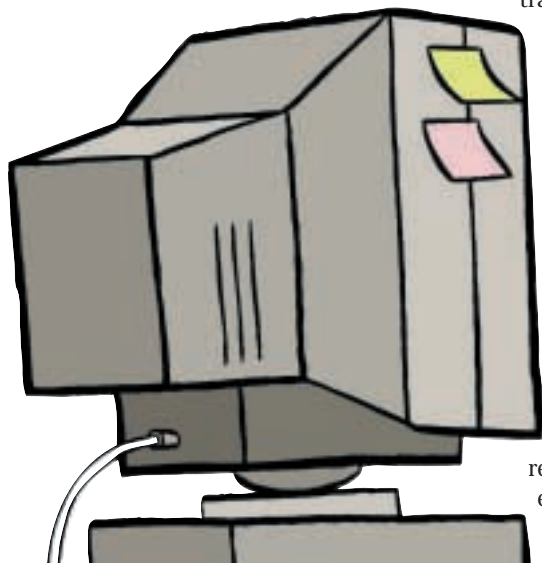
your ulterior motive is to take the qualification and run off to a better-paid job.

If you have no handy pile of cash, and you work in a pet shop, don't worry. There might be funding you can get from a number of sources to help you get on a course.

Anne Coquin of the eskills NTO says that funding for NVQ courses can be obtained from various bodies. 'You should contact your local authority, and your local Training and Enterprise Council. The eskills NTO will also be happy to offer whatever assistance we can and steer you towards the right course, and to where you might get funding.'

There has long been a debate about whether you are better off in a classroom or going solo at your own pace. Most courses you will come across are classroom-based, but the growth of digital media like CD-ROMs and the web are reinvigorating the classroom versus solo debate, the case for the latter being that learning in your own time is much cheaper and more flexible than listening with a group of other students to a lecturer in front of a white board.

The two sides of the argument are well summed up as follows: first, advocating the classroom, Learning Tree's Brand said: 'The main strength of the classroom? In a word, completion. The drop-out rate for distance learning is very high. You need to be extremely motivated to see the course through on your own. There are far more people who lack this level of motivation than who have it, and that's a fact. Speed is the other argument for classrooms. You can get through a lot in four days with a good tutor, the kind of amount that might take weeks at home.'

And for distance learning, Adrian Snook of Vega SkillChange, a company that has produced a CD-ROM for elearning along with the eskills NTO, said: 'The pace of change of technology is more than most colleges can keep up with. The tutors will often have been hired five or more years ago, and will have lost contact with industry and what its needs are. With certain non-technical skills, a time lag of this sort is not important, but it is with IT. Elearning fits in

with people's lifestyles. For most people it isn't convenient to attend classes every week at a set time.'

In fact, there is some evidence that the worlds of distance learning and classroom learning are actually converging. In recognition of the fact that not every trainee has the money or time for several days on the trot in a class setting, many training companies are offering a hybrid. Morgan of QA Training said: 'Classroom training is expensive, if you are not funded by your boss. We offer a class-based introduction course now, which is supplemented by self-study using the web.'

The above-mentioned CD-ROM developed by Vega SkillChange also epitomises this detente between the worlds of class and solo. Aimed at people wanting to start a career in the IT services industry, it builds up to a qualification called IT Systems Support Technician. The product is being made available to colleges and training companies and will shortly be sold through retail outlets like PC World, if the eskills NTO gets its way.

The world of training is becoming more flexible, and this is good news for those seeking to make an IT career for themselves who might have to look after children, or a hold down a job that goes beyond nine to five.

Many courses now include as much business and administration tuition as actual technical information, geared to those who prefer to contemplate a future in management rather than in front of a screen. Jolene Smith, marketing manager of QA Training, said: 'IT people increasingly need to know about project management, team building and other professional skills. It's not all about technology.'

So forget presenting *Big Brother*, and put away that sarong. An IT career is yours for the taking.

Contact details
eskills NTO 020 7580 6677
Spring Training 020 7452 7300;
QA Training 01285 883465
Learning Tree 01372 226500
Vega SkillChange 01332 205800

On-the-job training versus the classroom

Rowland Benedict, 31, currently works for CatchWord, an Oxford-based publisher of academic information on the Internet. Instead of using conventional web programming languages, CatchWord depends on its own proprietary software, RealPage. Naturally, this made any kind of external training

course a bit of an irrelevance for Rowland, and instead he was trained internally by CatchWord staff who were already experienced with the system.

He said: 'They went through the basics of the system with me, and then let me get used to it on my own, with me asking questions

when I got stuck. So quite a lot of my training was spent with manuals, at my own pace, and the rest was informal but geared to what I really needed to know, rather than anything too theoretical.'

He does not feel that he lost out by bypassing the classroom environment. 'Classes don't really appeal

to me, to be honest. It's all a bit back to school for my liking. Besides, if you add up all the time my employers spent with me, helping me to get used to how the system works, it would have cost a small fortune at a training company. In any case, being able to do the job is what counts at the end of the day.'

MANUFACTURERS ARE CREATING CLOTHES THAT INCORPORATE WEARABLE TECHNOLOGY

Chips on a catwalk

FUTURES FIRST LOOKED AT 'smart clothing' nearly three years ago, when we reported on Canadian computer scientist Steve Mann, who had a computer sown into his underpants (we can't quite remember why). Until recently, smart clothing has remained a curiosity, or had only military applications, but now it's coming to a clothes shop near you.

Earlier this year the Los Angeles-based Charmed Technology (www.charmed.com) staged the Brave New Unwired World Fashion Technology Show at the Internet World Show in London. Charmed is trying to integrate wearable technology with high-street fashion – 'geek chic', it's been called. Some cynics have suggested that there's no such thing as eclothing – it's merely ordinary clothing with lots of pockets strategically situated to hold bits of computers and peripherals. But it's actually getting a bit more sophisticated than that.

UK company Electrotextiles is developing what it calls 'smart fabric' (www.electrotextiles.com). The company is weaving conductive fibres together with traditional fibres to create fabrics that are completely flexible, as well as touch and pressure sensitive. The conductive fibres are weaved horizontally and vertically to make a matrix that can sense exactly where it's being touched. You could have a TV remote control woven into your sleeve, for example, or a computer keyboard sown into your T-shirt.

Available already is the ICD+ range of jackets jointly developed by Philips and Levi's. The jackets will contain an MP3 player, GSM mobile phone, remote control, a microphone in the collar and washable wiring. It will sell in the shops for around £600.

US company Charmed Technology (above) is producing clothing that combines urban street chic with wearable technology. Eclothing (right) will feature built-in devices such as MP3 players, GSM phones and even portable PCs

Inevitably, someone has seen the potential of eclothes for advertising products. In San Francisco, Stephen Fitch has sewn a laptop into a jacket, but mounted the LCD screen on the back of the jacket. He walked around a recent advertising conference showing Microsoft adverts on his back. With advances in flexible thin screens made from organic light-emitting diodes promised by companies like Universal Display Corporation (www.universaldisplay.com), it'll soon be possible to make complete articles of clothing into display screens. We'll see the sandwich-board man back on the street, but this time his whole body will be displaying 'The End is Nigh', probably as a web page. You'll be able to walk up to him and click for further details.

Back in the fashion world, Charmed is promising Internet-ready accessories, although much of what the models were sporting on the catwalk were actually plastic mock-ups of the real thing. With Charmed Jewellery, you'll dictate emails into your necklace, hear spoken emails through tiny speakers in earrings, and then get your voicemail through your bracelet. Then there's the Charmed Badge, for the conference-goer who loves networking but hates people. Instead of swapping business cards or, heaven forbid, actually talking to someone, you simply aim your Charmed Badges at each other, and all contact details are automatically exchanged.

As for powering your eclothes, all you'll need to do is walk. The Electric Shoe Company (www.theelectricshoeco.com), co-founded by pioneering clockwork radio inventor Trevor Baylis, has developed a prototype shoe that uses Piezoelectric crystals to generate current when stressed under the weight of your footstep. The power generated is only a few milliwatts, but it's enough to trickle-charge a battery. The military is keenly interested in the technology, since powering troops and their hi-tech equipment in the field is a big problem. In fact, the Defence Evaluation and Research Agency has already contracted Baylis to develop the technology for soldiers.

Eclothing may well turn out to be the WAP of the fashion world, or it might be something that will really catch on and become a part of all our lives. So the next time someone calls you a smarty-pants, they might actually be technically correct.

TOBY HOWARD
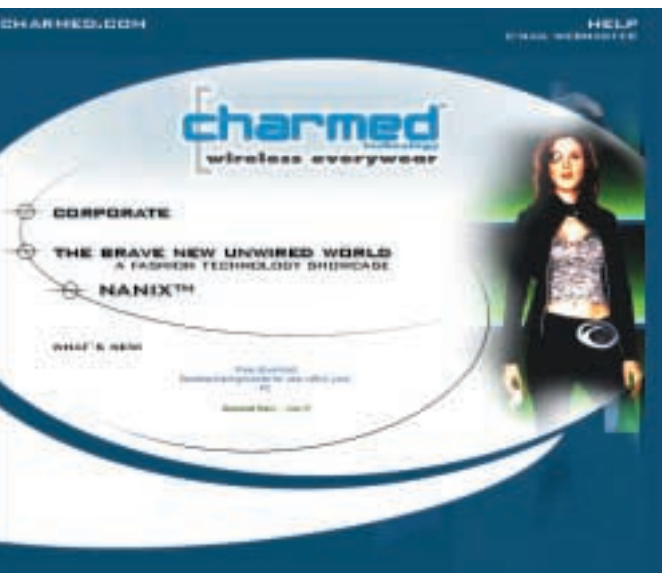
SIMPLE TRUTHS MAY HOLD THE KEY TO CREATING ARTIFICIAL INTELLIGENCE

Modelling minds

CHRIS MCKINSTRY IS A MAN with a rather unusual mission. He wants to use the web to create true artificial intelligence – a working model of human thought.

For his day job, McKinstry runs the European Southern Observatory's Very Large Telescope in Chile (www.eso.org/projects/vlt), but it's his Mindpixel Digital Mind Modelling Project that is attracting attention.

McKinstry is a veteran of the annual Loebner Prize competition (www.loebner.net), in which artificial intelligence programs compete for the best performance in a Turing Test – attempting to give responses to questions which would be indistinguishable from a human's answers. After becoming disillusioned with the Turing Test, which he believed was testing human-like interaction rather than basic human reasoning, McKinstry decided on a new approach: to make a model of the mind based on simple facts that are either true or false. McKinstry calls these facts 'MindPixels'.

McKinstry believes that what makes us human is our knowledge of the world around us. In his view, what we regard as 'truths' about the world are built up from layers upon layers of more simple truths that ultimately hinge on facts that are either true or false. So, he reasons, if you can create a database of knowledge that contains a huge number of yes/no facts, such a database will effectively encapsulate a view of the world. This is what the MindPixel project is trying to do.

The MindPixel project is attempting to create a model of the mind based on a database of knowledge built up from yes/no facts

The first phase is to collect the MindPixels, and that's where the web comes in. McKinstry wants people to visit his website at www.mindpixel.com and talk to a program called GAC, for Generic Artificial Consciousness. When you 'talk' to GAC (pronounced 'Jack'), you submit a MindPixel of your choice – '*PCW* is a jolly good read', for example. Subsequently, this MindPixel will be presented to other people for validation. And in return for submitting your own MindPixel, you're asked to validate a set of 20 others, stating whether each is true or false. To give you an idea of the kind of facts GAC is learning, here are a few MindPixels I validated recently: Drinking ammonia is good for your health. Is today Monday? Is Istanbul a city in Turkey? Oporto is in Portugal. Does a mink have fins? We all need love. Milk does a body good. Is it always dark at night? People are larger than ants. Panama is an isthmus. Does a deer have feathers?

The MindPixel project is distributed computing of a kind: 'It's like Seti@home in many respects,' said McKinstry, 'but we're not after your CPU's cycles, we want your humanness'. And it's certainly starting to catch on: 16,500 people have registered, and GAC's database already contains over 136,000 MindPixels.

Once a big enough database has been built, and McKinstry estimates he'll need a billion validated MindPixels, the second phase of the project will begin, probably around 2010. The database will be used to train a neural network – and the end result, said McKinstry, will be a model of the human mind that can respond correctly to queries that are not directly answerable by the MindPixels in its database.

McKinstry's isn't the first attempt to create a database of human common-sense knowledge. Cycorp's Cyc project started in 1984, with similar goals (www.cyc.com). But the Cyc database, which currently contains 400,000 cross-referenced facts, is being built entirely by hand by a small number of 'knowledge engineers'. Cyc learns 'top-down', as its programmers encode facts in carefully-designed interrelated tree structures. In contrast, GAC learns about the world in a more chaotic 'bottom-up' manner.

What GAC will turn out to be like is anyone's guess. But even if it's never truly intelligent, it'll be handy to have around for a pub quiz.

TOBY HOWARD

That's Entertainment

Some of the fastest processors and best graphics cards around are on test this month in these ultimate entertainment PCs, so start reading if you want to have fun with your PC

With the 1GHz processor now a fairly standard component in today's high-end systems, gaming has never been so good. PCs have made a transition in the past few years from work machines with possible gaming capabilities to entertainment units with speakers and graphics cards far in excess of what you'll need to watch the animations on your CD-ROM-based encyclopaedia.

This month we're looking at entertainment PCs, which is basically those that have been built not so much with office applications in mind, but rather focusing on fun stuff like gaming and DVD. The machines boast some of the fastest processors, the most advanced graphics cards and biggest and best speaker systems, which overall make these the entertainment PCs you'd most like to have. They're not cheap, but you get the best. And with DVD viewing an option too, you can share the experience around as well.

The manufacturers were given the following guidelines: a minimum 800MHz processor, at least 128MB of RAM, a good sized hard disk, a sound card and speaker system, Windows ME, a DVD, a CD-RW, a 19in monitor and a three-year warranty. It's a lot to get into a system costing £2,000 ex VAT.

Be prepared, though, for this money you can get a blisteringly fast machine that will have you glued to your monitor far longer than you might want to be.

contents

• PCs tested by Lars-Goran Nilsson and reviewed by Scott Montgomery

Atlas **Meridian A1100T PW**

THIS CAN ONLY BE described as one of the preferred systems for the hard-core gamer. Everything about it screams games as Atlas has made this one of the fastest machines you can get.

Based on the Asus A7V motherboard, the four available PCI slots remain almost empty. Only one is filled by the Sonic Fury Virtual MPU-401 sound card. The PCI/AMR shared slot houses the AMR modem, leaving three PCI slots for upgrade.

As the focus is on high performance, a 1.1GHz Athlon processor is strapped to the motherboard. This is backed by two banks of PC133 memory, giving the system a total of 256MB of RAM. This leaves one slot free, meaning memory can be boosted to a potential 768MB without throwing away what's already there.

A GeForce2 Ultra graphics card is slotted into the motherboard's AGP Pro slot. This graphics solution is currently the fastest available and, along with the processor and memory, it powers this machine to almost unheard of scores, only beaten by the Viglen in the 3DMark tests. The Atlas has good air flow through the case to keep everything cool.

The 19in CTX PR960F display is excellent with a well focused image and very good colour representation. Running Quake III at 1,280 x 1,024 in 32bit colour is a treat, especially since

the PC managed 55 frames per second.

The UltraDMA100 hard disk is a 46.1GB IBM Deskstar, which runs optimally under the onboard UltraDMA-100 Promise controller. For optical reading and writing, there is an Asus DVD-ROM and a Mitsumi CD-RW. Atlas has also included some media to get you started.

The speaker system is the VideoLogic DigiTheatre, so you'll be able to get the full Dolby Digital AC-3 effect when watching DVDs. Overall, it may seem sparsely populated as a system; but for the dedicated gamer, it is fast, with every component geared for performance.

DETAILS

PRICE £2,231.32 (£1,899 ex VAT)
CONTACT Atlas 07000 285 275
www.atlasplc.com
PROS Ultra-fast gaming machine with good upgrade possibilities; good warranty
CONS Not as many extras as some of the competition
OVERALL For the dedicated gamer, this machine will appeal. For those who want extras bundled, it will seem too sparse

FEATURES	★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Carrera **Octan M1000**

UNLIKE SOME OF the larger units in this month's test, Carrera's system has a standard sized midi-tower case. Despite this, there is still room for upgrade as there are two free 5.25in bays and a 3.5in bay for additional hardware.

The M1000 has a powerful 1GHz Athlon processor mounted on a VIA KT133 chipset-based Asus A7V motherboard. This excellent board has five USB ports as standard and a connector for a further two, and four

EIDE sockets – two UltraDMA66 and two UltraDMA100 (the latter controlled by the onboard Promise chip). The 30.7GB IBM hard disk is connected to one of the UltraDMA100 ports, giving it access to the increased bandwidth.

A single 256MB stick of PC133 SDRAM is included, leaving two DIMM sockets free to upgrade the memory to 1.25GB without removing the installed RAM. The PCI slots are filled with the SoundBlaster Live! sound card, which pipes its signal to the Altec Lansing ACS54 speakers; while a FireWire card (with three external sockets and one internal) and a 56K modem fill two more slots. With the Hauppauge Win-TV card filling the final PCI slot, only one PCI card or an AMR can be added, but then you're unlikely to need to install any more cards. On the optical front, a Pioneer DVD-105 DVD-ROM drive and a Panasonic CD-RW enable disc-to-disc copying.

The graphics are processed by a 64MB GeForce2 GTS which is ideal for gaming purposes. There's also an S-Video out socket so watching DVDs on your TV is an option. The monitor supplied is the 19in Iiyama VisionMaster Pro 450. This is a great monitor boasting a Mitsubishi Natural Flat Diamondtron tube. The result is a clear picture with rich and vibrant colours.

Overall the Carrera is a decent system as well as being one of the fastest on test. What you get is a solid machine at a comparatively reasonable price, although Mesh offers a similar spec for £100 less.

DETAILS

PRICE Price £2,113.82 (£1,799 ex VAT)
CONTACT Carrera 020 8307 2800
www.carrera.co.uk
PROS Cheaper than most; performance is good; FireWire card
CONS Mesh has put together a cheaper alternative
OVERALL A good effort from Carrera, but the competition is pretty stiff and better deals are on offer elsewhere

FEATURES	★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★

Dan **Ultimate X**

DAN'S SYSTEM DOES NOT sport a GHz processor and is also one of only three entrants not powered by an AMD solution. Instead, the installed CPU is a respectable 933MHz Pentium III. Although, as the Viglen has shown by topping the 3D tables, the 933MHz Pentium III can compete with the 1.1GHz Athlons when it's married to the right components.

The motherboard is an Intel 815E-based Asus CUSL2. This board walked away with the Editor's Choice award in last month's motherboard group test. Taking care of storage is a 46.1GB Maxtor hard disk, while for optical reading and writing, there's an Acer DVD-ROM and CD-RW. Installed in three of the four available PCI slots are the SoundBlaster Live! sound card (which drives the Cambridge Soundworks Desktop Theatre speaker system), the modem, and the Hauppauge Win-TV TV tuner card. This leaves one dedicated PCI slot free for upgrade, along with the two shared slots which could house another two PCI cards if required. Sitting in the AGP slot is a 64MB ATi Radeon card, making this one of the preferred systems for DVD viewing, due to the excellent motion compensation capabilities of the Radeon and Dan's inclusion of various audio/video cabling to maximise the home theatre aspect. The video card is married to a 19in Iiyama VisionMaster Pro 450 monitor, but also has video in/out for connection to a TV or video peripherals. The image on the monitor was first rate.

With a Microsoft Gamepad bundled, along with three games (albeit a little long in the tooth), you could be playing on this computer as soon as you have it set up, although it doesn't match the performance of the Pentium III-powered Viglen with its GeForce2 Ultra.

Microsoft Works 2000 is included, although Works Suite would have been preferable. This system is neither blindingly fast, nor are there lots of extras. It is a solid performer, though, and if DVD viewing or video in/out is your thing, this is worth a look.

DETAILS
PRICE £2,350 (£2,000 ex VAT)
CONTACT Dan 020 8830 1100
www.dan.co.uk
PROS DVD playback is well catered for; good monitor
CONS Performance is mid-range in this test
OVERALL A decent enough machine from Dan, but there are better models on test

FEATURES	★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

evesham.com **Origin 110**

WITH ITS 1.1GHZ Athlon processor and two 128MB PC133 memory modules slotted into two of the three available DIMM slots, this PC is on par with the other ultra-fast machines. However, the VIA KT133-based Chaintech CT-7AJA motherboard doesn't support UltraDMA100, so the system isn't quite as cutting edge as the other 1.1GHz PCs. This is unfortunate since the 40.9GB Maxtor DiamondMax Plus hard disk is an UltraDMA100 unit.

Apart from these limitations, this is a good all-round system. The motherboard has three free slots for upgrade: two PCI and one PCI/ISA shared slot. The AMR slot plays host to the modem. The case is neatly set out, with all cables bound in spiral plastic casing.

A Panasonic CD-RW is in one of the three 5.25in drive bays, while a 16-speed Pioneer DVD-ROM drive rounds off the optical peripherals. The 64MB ATi Radeon graphics card makes this machine great for home theatre use. The ATi card produces excellent DVD playback, as well as having video in/out sockets so you can connect up to a television instead of the supplied Mitsubishi Diamond Plus monitor for that true movie feel.

Sound is taken care of by a SoundBlaster Live! card and Cambridge Soundworks Desktop Theatre speakers, providing the full Dolby Digital AC-3 sound experience.

The Hauppauge Win-TV tuner card, allows you to convert your PC to receive terrestrial TV channels. You could even use the PC as a video recorder, although even a large hard disk would fill up pretty quickly. A variety of cables ensure you have all you'll need to utilise the entertainment capabilities of this PC.

With no software apart from a recovery disc, you won't be playing games on the Origin out of the box, but then the price allows scope for buying some gaming peripherals and/or games to get you up and running. Overall, the Evesham's performance was quite good, and you get a three-year on-site warranty thrown into the bargain.

DETAILS
PRICE £2,231.32 (£1,899 ex VAT)
CONTACT evesham.com 0800 038 0800
www.evesham.com
PROS DVD playback is well catered for; good warranty
CONS No UltraDMA100 support
OVERALL The lack of UltraDMA100 support is disappointing, but on the whole evesham.com has put together a solid system

FEATURES	★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Mesh **Matrix Ultima A1100**

MESH HAS OPTED FOR the fastest freely available processor for the Matrix Ultima – a 1.1GHz Athlon. To back this up, 256MB of SDRAM is installed on the motherboard in one of the three DIMM slots. Only PC100 memory is installed despite the fact that the Asus A7V motherboard can run PC133. This is unfortunate as the system could have run a bit faster. If you want to upgrade you'll need to throw away the RAM that's currently installed.

Despite this issue, the specification of this PC is excellent. The A7V motherboard has five USB ports as standard, with an onboard connector for a further two, as well as four EIDE connectors (two UltraDMA66 and two UltraDMA100), allowing connection of up to eight devices. The system comes with a 46.1GB UltraDMA100 IBM Deskstar hard disk, a Pioneer DVD-115 DVD-ROM drive, and a Philips PCRW804 CD-RW. This means five further EIDE devices can still be fitted into the machine.

With four of the five PCI slots filled, there is little room for card expansion, however there is an AMR free. The PCI slots are populated by the modem, an ATi TV tuner, a FireWire card (with three external and one internal ports), as well as a SoundBlaster Live! sound card. A FireWire cable is also included to allow connection of video peripherals.

The graphics solution is a 64MB ATi Radeon, which not only gives hardware environment bump mapping and T&L capabilities, but also has video in and out. This, along with the onboard Rage Theatre chip, makes it an ideal card for gaming and DVD playback. However, Mesh has only supplied PC Works Four Point Surround speakers, so you won't get the full Dolby Digital effect from your DVD movies. Making up the other half of the display set is a 19in Mitsubishi Diamond Plus 91 monitor that produces an excellent on-screen image.

Mesh has produced a good all-round spec and still managed to keep the price down. With Works Suite 2000 bundled, you're ready for work as well.

DETAILS
PRICE £1,996.33 (£1,699 ex VAT)
CONTACT Mesh 020 8208 4706
PROS Low cost for the specification
CONS The system memory is PC100 instead of the faster PC133
OVERALL A good all-round system that is cheaper than the competition. Not the fastest in the test, but capable of both gaming and digital video editing

FEATURES ★★★★
PERFORMANCE ★★★
VALUE FOR MONEY ★★★★★
OVERALL RATING ★★★★

Panrix **Magnum Max 1G**

WITH A GIANT FAN blowing warm air out the back of the case the Panrix system is cool. Thankfully that's not the only good thing about this machine. As with many of the test systems, the Asus A7V motherboard makes up the Magnum's backbone.

The processor is a respectable 1GHz Athlon: very fast, but not as expensive as the 1.1GHz. The onboard memory is a single 256MB PC100 stick. Panrix, like Mesh, opted for the slower memory and this is reflected in the system's scores.

Apart from this glitch, the rest of the spec is excellent. The massive 61.4GB IBM Deskstar hard disk uses the motherboard's Ultra-DMA100 capabilities, while a Plextor BURN-Proof CD-RW drive sits in an UltraDMA66 socket. For DVD, a Toshiba SD-M1402 is installed.

Like many of the test systems, a Hauppauge Win-TV tuner card is fitted into one of the five PCI slots, expanding the usefulness of the system. Panrix has included a remote control, which some other manufacturers did not, so a bit of armchair channel hopping is an option. Occupying some of the other PCI slots are a Creative SoundBlaster Live!, which drives the Cambridge Soundworks Desktop Theatre speaker system, giving you the option of true Dolby Digital 5.1 channel surround sound.

On the graphics front, a 32MB 3D Prophet II GTS sits in the AGP slot.

Although not the 64MB version, this card is a fine example of a GeForce2 chipset-based card, and with heatsinks on the memory it runs extra cool. The Mitsubishi Diamond Plus 91 19in monitor makes another appearance, producing a quality image.

With a Gravis Blackhawk joystick and a games bundle that includes Wargasm, Rollcage, Drakan and Rollercoaster Tycoon, this machine has some gaming in it from the word go. Microsoft Works 2000 is also included, although we'd have preferred Works Suite. Overall, the Magnum Max 1G is a good system, although it is let down by the slower memory.

DETAILS
PRICE £2,348.82 (£1,999 ex VAT)
CONTACT Panrix 0113 244 4958
www.panrix.com
PROS Excellent cooling; large hard disk; good games bundle; Plextor CD-RW
CONS Let down by PC100 memory
OVERALL Panrix has put together a machine made up of quality components, but there are better machines available for less money

FEATURES ★★★★
PERFORMANCE ★★★
VALUE FOR MONEY ★★★
OVERALL RATING ★★★

Polar Phantom 1000

THE PHANTOM IS driven by a 1GHz Athlon processor that, sadly, is only backed by 128MB of PC100 SDRAM. There are two free DIMM sockets, although without throwing away the supplied memory, the motherboard's potential for running PC133 memory will not be realised. The QDI VIA KT133 chipset-based KinetiZ 7T motherboard does not support UltraDMA100, so this PC is not as cutting edge as some of the other 1GHz Athlon units we have tested.

As for general upgrade, there is a 3.5in bay and a 5.25in bay vacant, and of the four PCI slots present, two are filled: one by the VideoLogic Sonic Fury sound card and the other by the modem. Two remain free for upgrade along with the AMR and the shared PCI/ISA slot.

The hard disk is a 30.7GB IBM Deskstar and removable storage is covered by a Samsung SW-208B CD-RW. A Pioneer DVD-105 enables disc-to-disc copying and a DVD demo disc is included. A Hercules 3D Prophet II GTS 64MB drives the Mitsubishi Diamond Pro 1010E. At 21in this can be used as a home cinema, but the speaker system lets it down slightly.

Coming with a quality set of speakers, VideoLogic's DigiTheatre DTS, this appears at first to be an excellent setup. The problem is the sound card does not have a digital output that is compatible with the speaker's digital requirements. So you need an adaptor to use the Dolby Digital DTS element of the speakers. This is also a bizarre combination since the Sonic Fury has an onboard Dolby Digital processor, so you don't need an external one. That said, a cable won't cost much and you will have an awesome sound setup that supports DTS and AC-3.

The Polar is an acceptable system, although along with Time's PC it would not run 3DMark. The incompatibility of the speaker/sound card ports is an irritation, while the memory and UltraDMA100 limitations leave this system a little behind others in the test.

DETAILS

PRICE £2,350 (£2,000 ex VAT)
CONTACT Polar Technology 0161 482 7000
www.polartechnology.com
PROS Good 21in monitor; great speaker set when you get a cable
CONS No UltraDMA100; PC100 memory; adaptor needed to correctly utilise speakers
OVERALL The Polar is not quite as cutting edge as others in the test. Addressing some of the problems would improve the situation, but you're better off looking at the Systemax

FEATURES	★★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Systemax P1000RV Entertainment

THE SYSTEMAX IS one seriously large machine with a huge case housing the 1GHz PIII. The unit has five 3.5in bays and five 5.25in bays. The larger bays house a Pioneer DVD-105, an Iomega Zip CD and the Live! Drive II for the Creative SoundBlaster Live! Platinum, leaving two free. There are three 3.5in bays free, the others being occupied by the floppy drive and the 30.7GB Maxtor DiamondMax hard disk.

The motherboard is an Intel 815E-based AOpen AX3S, which grabbed a Highly Commended award in last month's motherboard group test. Occupying one of the DIMM slots is a single 256MB stick of PC133 memory, leaving two slots free. For upgrade in the expansion slots, only one PCI slot is vacant. The other slots are filled by all the components you'd want from an entertainment PC. The Sound-Blaster Live! Platinum card occupies two backing plate positions, effectively blocking a PCI slot, but the versatility of the card and its connectivity options more than makes up for the space it occupies. With front access to coaxial and optical digital in and out, this will be the preferred unit for the sound enthusiast, especially if you want to master to MiniDisc or DAT. The Cambridge Soundworks Desktop Theatre 5.1 produces true Dolby Digital surround sound from DVD movies. The other PCI slots are filled by the modem and the Hauppauge Win-TV tuner card.

An ATi Radeon, coupled with a 19in CTX PR960F monitor with a Sony FD Trinitron tube, is a good display solution, with the Radeon being a versatile card for both graphical features and for DVD playback, while the monitor has an excellent on-screen image.

A Sidewinder Force Feedback joystick, a microphone and a couple of games (including the hit Aliens vs Predator), helps cover all the bases well. As a games platform, it will cope with all you can throw at it; and as a home theatre system it's hard to beat.

DETAILS

PRICE £2,231.32 (£1,899 ex VAT)
CONTACT Simply 0870 7297 366
www.simply.co.uk
PROS Excellent all-round system at a very reasonable price
CONS The case may be a bit too large for some people
OVERALL For gaming or DVD, this is an ideal PC. It's well-priced, has a good specification, and has lots of room for upgrades

FEATURES	★★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★★

Time Machine 1100-7VQ Pro

ALTHOUGH ITS BASIC spec is similar to the Mesh entry, the Time Machine outperforms its rival by a considerable margin. Like the Mesh, the processor is a 1.1GHz Athlon and sits on the excellent Asus A7V motherboard. Unlike the Mesh, though, there is only 128MB of SDRAM, instead of 256MB. However the RAM is PC133, which may account for some of the performance boost. Two DIMM slots are free for upgrade.

Two PCI slots out of the available five are free for upgrade and there is also an AMR slot. The other three PCI slots house a modem, SoundBlaster Live! sound card, and a Hauppauge Win-TV card.

The graphics solution is geared towards gaming. The 64MB Hercules 3D Prophet II is a very fast card, although it's now eclipsed by the GeForce2 Ultra. Add to this a Saitek R4 Force Wheel and a Sidewinder Force Feed-back joystick, and it's obvious that this machine is aimed at the gamer. Unfortunately the Hercules card would not run the 3DMark test due to some conflicts between the card, Windows ME and the benching software.

The 30.6GB Seagate Barracuda hard disk is not the largest in the tests, but is enough to install a few big games. A Teac CD-RW drive is included, as well as a Compaq-branded Pioneer DVD-114 DVD-ROM drive. With the Creative FPS 1000 speakers this may not be the last word in home theatre, but it's acceptable.

The 19in CTX PR960F monitor is an excellent display with a crisp image and excellent colour representation.

The PC's build quality was not as solid as some of the competition, but there were no major problems. Overall, though, with a diverse software bundle including language courses and games, and a digital camera for a bit of variety, the Time Machine is a fine system. Its processor is cutting edge and the rest of the components are of a similar standard. Overall, if you're after a gaming machine with gaming peripherals bundled, then the Time will be worth a look.

DETELS

PRICE £2,348.82 (£1,999 ex VAT)
CONTACT Time 01282 777 555
www.time computers.com
PROS An excellent gaming bundle
CONS Only 128MB of RAM; no Dolby Digital speakers
OVERALL If you're looking for a complete gaming solution, this is ideal. It includes everything you need to get you gaming from the moment the system arrives

FEATURES	★★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Viglen HomePro P3-933 DWR

THIS IS ONE OF TWO machines in this month's test to have a state-of-the-art GeForce2 Ultra graphics card, and as a result it is blisteringly fast. Despite running one of the lowest-clocked CPUs in the test: a Pentium III 933MHz, it still gave a blistering 104.7fps in Quake III at 1,280 x 1,024 with 16bit colour and textures, beating the GeForce2 GTS-based machines by a significant margin. With two sticks of 128MB PC133 SDRAM, leaving one DIMM slot free for upgrade, there has been no scrimping on the amount or quality of memory supplied.

The Intel 815E Easton motherboard supports UltraDMA100, allowing the capacious 46.1GB IBM Deskstar drive to function at its best. The motherboard also has diagnostic LEDs on the rear of the case, allowing any problems to be diagnosed without having to open the case. With five PCI slots and no AMR/CNR slots, there are two PCI slots vacant for upgrade. Occupying the other three are the modem, the SoundBlaster Live! Value sound card and an ATi TV-Wonder tuner card. The sound is piped to Altec Lansing speakers and, although these are branded as Dolby Digital speakers, the lack of a centre channel means they don't offer true 5.1 surround.

Taking care of the DVD and CD-RW duties are a Pioneer DVD-115 and a Sony CRX 140E.

The monitor is a Viglen-branded 19in FD Trinitron, and it's a fine unit, with excellent focus, colour representation and a minimum of distortion. Making good use of the monitor is the GeForce2 Ultra graphics card. If you're looking for a system with a cutting-edge gaming card and a quality monitor, the Viglen is worth a look. The inclusion of a Saitek Cyborg joystick means you have some gaming hardware to get you started, but no games are bundled. Works Suite 2000 is included though.

It may not have the fastest-clocked processor, but with the GeForce2 Ultra the 3DMark scores are outstanding. If you're after a games PC and have money to burn, it's worth checking this one out.

DETAILS

PRICE £2,348.82 (£1,999 ex VAT)
CONTACT Viglen 020 8758 7000
www.viglen.co.uk
PROS Very fast in 3D due to the GeForce2 Ultra; large hard disk
CONS Not as cheap, or with as many peripherals as our winners
OVERALL If it's the ultimate in 3D gaming speed you require, this system is the one to get

FEATURES	★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

How we did the tests

SYSmark 2000

This comprises 12 application workloads and a management program. The workloads are divided into two categories: office productivity and Internet content creation. We run the benchmark at a resolution of 1,024 x 768 in 16bit colour. It loops three times, rebooting between each workload.

It then assigns the system a performance rating for each application, based on a comparison of workload runtimes between the system being tested and a fixed calibration platform. A rating of 100 indicates the test system has performance equal to that of the calibration platform, 200 indicates twice the performance and so on. The calibration platform is based on a Pentium III 450MHz processor, an Intel 440BX chipset motherboard, 128MB of SDRAM, a 32MB Diamond Viper V770 Ultra graphics card, an IBM DJNA 371800 and Windows 98 SE.

Each category rating is a geometric mean of the workload ratings in that category. The overall rating is a weighted geometric mean of the category ratings.

Office productivity

Corel CorelDraw 9.0
This script first takes an abstract design, applies an Art Stroke to it and runs various filter effects. It creates and manipulates a scene composed of vector graphics. Next, it takes a raster image and applies effects. It creates several 3D objects and performs 3D manipulations.

Corel Paradox 9.0
This performs SQL-style queries on a database table and runs a 'find duplicates' query. It imports other text files, formatting and exporting each to HTML. Then it opens up query forms, enters
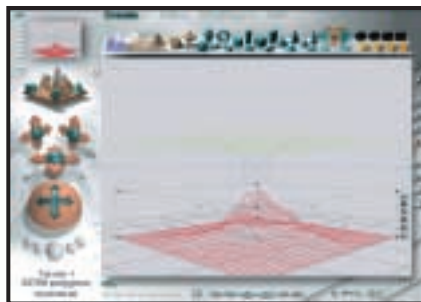
Bryce 4 script manipulates a wire frame scene and renders it

additional data and produces reports based on queries.

Microsoft Word 2000
This workload invokes word processing functions, including editing, spell checking, search and replace, font change, copy and paste, print preview, mail merge fields, insert hyperlinks, background and table formatting plus opening and viewing HTML pages.

Microsoft Excel 2000
Operations include closing and opening spreadsheets, HTML pages and data in text files, spell checks, formula calculation, plotting data, formatting charts and cells, analysing data in pivot tables, naming a cell and inserting hyperlinks.

Microsoft PowerPoint 2000
Operations include spell checks, editing, formatting and moving pictures, applying templates, formatting tables in slides, inserting hyperlinks, applying header and footer data, formatting

3DMark 2000 tests each system's DirectX performance (above) and OpenGL performance is tested via Quake III: Arena (right)

charts, applying graphics and sound effects, and adding movie files.

Dragon NaturallySpeaking Preferred 4.0
The script plays a pre-recorded wav file into Naturally-Speaking, which then converts the wav file to text.

Netscape Communicator 4.61
This opens a website of plays by Shakespeare and selects and loads the texts several times. Then it loads a page consisting of large tables, thumbnails and images and cycles through viewing the images.

Internet content creation

Adobe Premiere 5.1
This creates an animation of about 16 bmp files and other avi clips and puts transitions between them. It superimposes two audio tracks and runs the audio through filters.

Adobe Photoshop 5.5
The script loads, resizes, zooms out of images, applies filters to the images, changes mode and colour settings, adjusts image brightness and contrast and saves the image to a jpeg file.

Avid Elastic Reality 3.1
The workload sets up and renders a morph between two mpeg2-sized images (720 x 480 pixels, roughly 750KB).

MetaCreations Bryce 4
This script opens an assembled wire frame scene and renders it to the final image. Then a new image is opened and saved in Metastream format. Another image is opened and saved in an HTML-compatible format.

Microsoft Windows Media Encoder 4.0
The input file is an avi clip that is encoded using the MPEG4 Video Codec.

3DMark 2000

Remedy Entertainment's MAX-FX is used to test the DirectX performance of a system. It runs two specially coded games at low, medium and high resolutions. We ran the benchmark at 1,280 x 1,024 in 16bit and 32bit colour, with each game set to loop three times. The 3DMark is calculated as 12 times the combined frames per second for each game.

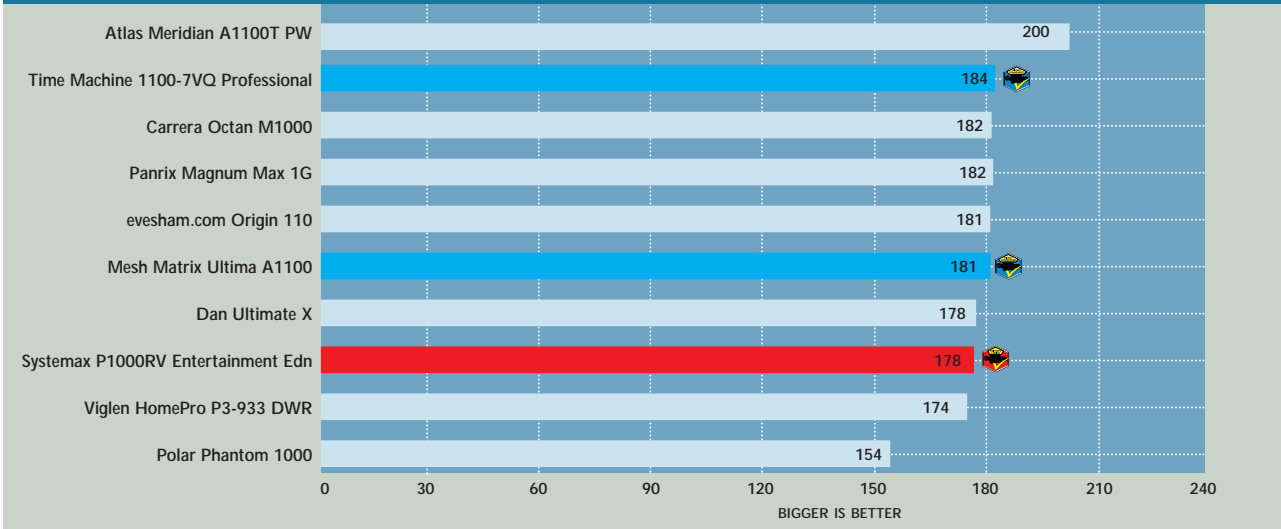### Quake III

We tested each system's OpenGL performance with Quake III: Arena (1.11). The settings were: video mode – 1,280 x 1,024; colour depth – 16bit and 32bit, full screen, highest texture detail; texture quality – 16bit and 32bit; texture filter – bilinear, lighting and lightmap.
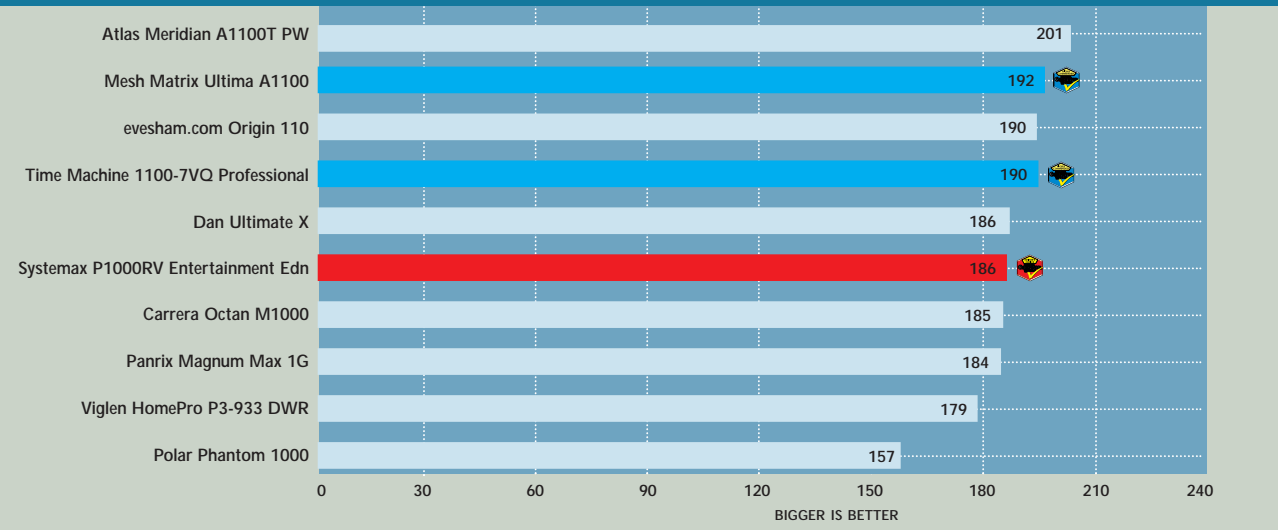At command prompt we typed:
```
timedemo 1
demo demo001
```
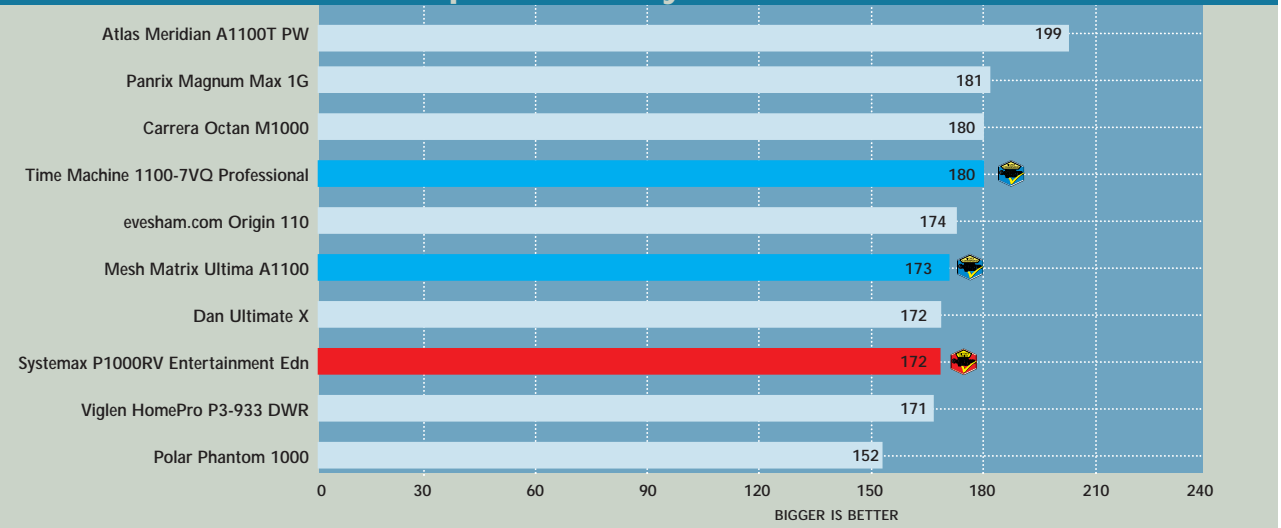This runs demo 1 and records the frames per second.

SYSmark 2000 overall

Atlas Meridian A1100T PW	200
Time Machine 1100-7VQ Professional	184
Carrera Octan M1000	182
Panrix Magnum Max 1G	182
evesham.com Origin 110	181
Mesh Matrix Ultima A1100	181
Dan Ultimate X	178
Systemax P1000RV Entertainment Edn	178
Viglen HomePro P3-933 DWR	174
Polar Phantom 1000	154

0 30 60 90 120 150 180 210 240

BIGGER IS BETTER

SYSmark 2000 Internet content creation

Atlas Meridian A1100T PW	201
Mesh Matrix Ultima A1100	192
evesham.com Origin 110	190
Time Machine 1100-7VQ Professional	190
Dan Ultimate X	186
Systemax P1000RV Entertainment Edn	186
Carrera Octan M1000	185
Panrix Magnum Max 1G	184
Viglen HomePro P3-933 DWR	179
Polar Phantom 1000	157

0 30 60 90 120 150 180 210 240

BIGGER IS BETTER

SYSmark 2000 office productivity

Atlas Meridian A1100T PW	199
Panrix Magnum Max 1G	181
Carrera Octan M1000	180
Time Machine 1100-7VQ Professional	180
evesham.com Origin 110	174
Mesh Matrix Ultima A1100	173
Dan Ultimate X	172
Systemax P1000RV Entertainment Edn	172
Viglen HomePro P3-933 DWR	171
Polar Phantom 1000	152

0 30 60 90 120 150 180 210 240

BIGGER IS BETTER

3DMark 2000 (1,280 x 1,024 at 16bit)

Viglen HomePro P3-933 DWR	6,363
Atlas Meridian A1100T PW	5,889
Carrera Octan M1000	4,949
Panrix Magnum Max 1G	4,946
evesham.com Origin 110	3,419
Systemax P1000RV Entertainment Edn	3,386
Mesh Matrix Ultima A1100	3,383
Dan Ultimate X	3,161
Polar Phantom 1000	DID NOT RUN
Time Machine 1100-7VQ Professional	DID NOT RUN

0   1,000   2,000   3,000   4,000   5,000   6,000   7,000
BIGGER IS BETTER

3DMark 2000 (1,280 x 1,024 at 32bit)

Viglen HomePro P3-933 DWR	4,450
Atlas Meridian A1100T PW	3,852
evesham.com Origin 110	3,201
Systemax P1000RV Entertainment Edn	3,181
Mesh Matrix Ultima A1100	3,180
Carrera Octan M1000	3,145
Dan Ultimate X	3,059
Panrix Magnum Max 1G	3,009
Polar Phantom 1000	DID NOT RUN
Time Machine 1100-7VQ Professional	DID NOT RUN

0   1,000   2,000   3,000   4,000   5,000   6,000   7,000
BIGGER IS BETTER

Quake III (fps) (1,280 x 1,024 at 16bit)

Viglen HomePro P3-933 DWR	104.7
Atlas Meridian A1100T PW	102.1
Carrera Octan M1000	86.9
Panrix Magnum Max 1G	79.2
Time Machine 1100-7VQ Professional	72.1
Polar Phantom 1000	64.9
Dan Ultimate X	50.5
Systemax P1000RV Entertainment Edn	48.2
Mesh Matrix Ultima A1100	48.1
evesham.com Origin 110	47.4

0   20   40   60   80   100   120
BIGGER IS BETTER

Quake III (fps) (1,280 x 1,024 at 32bit)

Viglen HomePro P3-933 DWR	73.7
Atlas Meridian A1100T PW	55
Carrera Octan M1000	52.5
Panrix Magnum Max 1G	49.8
Systemax P1000RV Entertainment Edn	45.6
Dan Ultimate X	45.5
evesham.com Origin 110	44.7
Mesh Matrix Ultima A1100	39.2
Polar Phantom 1000	39
Time Machine 1100-7VQ Professional	DID NOT RUN

0   20   40   60   80   100   120
BIGGER IS BETTER

Table of features

Manufacturer	ATLAS	CARRERA	DAN	EVESHAM.COM
Model name	MERIDIAN A1100T PW	OCTAN M1000	ULTIMATE X	ORIGIN 110
Price inc VAT (ex VAT)	£2,231.32 (£1,899)	£2,113.82 (£1,799)	£2,350 (£2,000)	£2,231.32 (£1,899)
Telephone	07000 285 275	020 8307 2800	020 8830 1100	0800 038 0800
URL	www.atlasplc.com	www.carrera.co.uk	www.dan.co.uk	www.evesham.com
HARDWARE SPECS				
Processor	1.1GHz Athlon	1GHz Athlon	933MHz Pentium III	1.1GHz Athlon
RAM/type	256MB PC133	256MB PC133	256MB PC133	256MB PC133
Occupied RAM slots/spare RAM slots	2/1	1/2	2/1	2/1
Max memory in this configuration	768MB	1.28GB	512MB	768MB
Maximum memory supported by motherboard	1.5GB	1.5GB	512MB	1.5GB
Hard disk (manufacturer and model)	IBM Deskstar	IBM Deskstar	Maxtor DiamondMax	Maxtor DiamondMax Plus
HD size/interface	46.1GB EIDE	30.7GB EIDE	46.1GB EIDE	40.9GB EIDE
Storage drive model and manufacturer	Mitsumi CR-4804TE	Panasonic CD-RW CW-7585	Acer CDRW 84321A	Panasonic CD-RW CW-7585
Size of storage drive media	650MB (1 x CD-R, 1 x CD-RW inc)	650MB	650MB (1 x CD-RW inc)	650MB
MOTHERBOARD COMPONENTS				
Motherboard manufacturer	Asus	Asus	Asus	Chaintech
Model/chipset	A7V/KT133	A7V/KT133	CUSL2/Intel 815E	CT-7AJA/VIA KT133
EXPANSION AND I/O				
No of 3.5/5.25in bays	4/3	3/4	4/3	3/2
No of free 3.5/5.25in bays	2/1	1/2	2/1	1/0
No of PCI/ISA/shared/AMR slots	4/0/1/0	4/0/1/0	4/0/2/0	4/0/1/1
No of free PCI/ISA/shared/AMR slots	3/0/0/0	0/0/1/0	1/0/2/0	2/0/1/0
No of USB/serial/parallel/PS2	2/2/1/2	5/2/1/2	2/2/1/2	2/2/1/2
MULTIMEDIA				
DVD manufacturer/model	Asus DVD-ROM E608	Pioneer DVD-105	Acer DVD	Pioneer DVD-115
DVD speed/interface	8x EIDE	16x EIDE	16x EIDE	16x EIDE
Sound card manufacturer	VideoLogic	Creative	Creative	Creative
Sound card model	Sonic Fury	SB Live! Value w/out internal SPDIF	SB Live! OEM w/out internal SPDIF	SBLive!
Speakers (manufacturer and model)	VideoLogic DigiTheatre	Altec Lansing ACS54	Cambridge Soundworks Desktop Theatre 5.1	Cambridge Soundworks Desktop Theatre 5.1
Graphics card manufacturer and model	nVidia GeForce2 Ultra	3D Power GeForce2 GTS	ATi Radeon	ATi Radeon
Chipset	GeForce2 Ultra	GeForce2	Radeon	Radeon
RAM and type	64MB DDR	64MB DDR	64MB DDR	64MB DDR
Graphics card interface	AGP	AGP	AGP	AGP
Monitor manufacturer/model	CTX PR960F	Iiyama VisionMaster Pro 450	Iiyama VisionMaster Pro 450	Mitsubishi Diamond Plus 91
Monitor size/max viewable diagonal	19in/18in	19in/18in	19in/18in	19in/18in
Maximum resolution and refresh (Hz)	1,600 x 1,200/85Hz	1,600 x 1,200/85Hz	1,600 x 1,200/85Hz	1,600 x 1,200/75Hz
OTHER INFORMATION				
Modem manufacturer and model	Supra SST 56i Pro DF	PC-Tel HSP PCI modem	Conexant HCF data fax modem	AMR voice modem
Misc hardware	Assorted audio/video cables	1394 FireWire card, FM aerial, Hauppauge Win-TV & radio with remote	Hauppauge Win-TV, Microsoft Gamepad, Assorted audio/video cables	Hauppauge Win-TV Assorted audio/video cables
Bundled software	Lotus SmartSuite Millennium Edition, Digital audio sequencer and sampler	Lotus SmartSuite Millennium Edition, Video Wave III	Microsoft Works 2000, Savage Arena, Expendable, Incoming	Recovery disc
Standard warranty	3 years on site	1 year on site, 2 years rtb	1 year on site, 2 years rtb	3 years on site

	MESH	PANRIX	POLAR	SIMPLY	TIME	VIGLEN
	MATRIX ULTIMA A1100	MAGNUM MAX 1G	PHANTOM 1000	SYSTEMAX P1000RV ENTERTAINMENT EDN	TIME MACHINE 1100-7VQ PRO	HOMEPRO P3-933 DWR
	£1,996.33 (£1,699)	£2,348.82 (£1,999)	£2,350 (£2,000)	£2,231.32 (£1,899)	£2,348.82 (£1,999)	£2,348.82 (£1,999)
	020 8208 4706	0113 244 4958	0161 482 7000	0870 7297 366	01282 777 555	020 8758 7000
	www.meshcomputers.com	www.panrix.com	www.polartechnology.com	www.simply.co.uk	www.timecomputers.com	www.viglen.co.uk
	1.1GHz Athlon	1GHz Athlon	1GHz Athlon	1GHz Pentium III	1.1GHz Athlon	933MHz Pentium III
	256MB PC100	256MB PC100	128MB PC100	256MB PC133	128MB PC133	256MB PC133
	1/2	1/2	1/2	1/3	1/2	2/1
	1.28GB	1.28GB	1.15GB	512MB	1.15GB	512MB
	1.5GB	1.5GB	1.5GB	512MB	1.5GB	512MB
	IBM Deskstar	IBM Deskstar	IBM Deskstar	Maxtor DiamondMax	Seagate Barracuda	IBM Deskstar
	46.1GB EIDE	61.4GB EIDE	30.7GB EIDE	30.7GB EIDE	30.6GB EIDE	46.1GB EIDE
	Philips PCRW804	Plextor CD-R PX-W1210A	Samsung SW-208B	Iomega Zip CD 1024INT	Teac CD-W54E	Sony CRX 140E
	650MB (1 x CD-R, 1 x CD-RW inc)	650MB (1 x CD-R, 1 x CD-RW inc)	650MB	650MB (1 x CD-R inc)	650MB	650MB (1 x CD-R, 1 x CD-RW inc)
	Asus	Asus	QDI	AOpen	Asus	Intel
	A7V/VIA KT133	A7V/VIA KT133	KinetiZ 7T/VIA KT133	AX3S/Intel 815E	A7V/VIA KT133	Easton/Intel 815E
	3/3	4/3	5/2	4/5	4/3	4/2
	1/1	2/1	3/0	2/2	2/1	2/0
	4/0/1/0	4/0/1/0	4/0/1/1	4/0/1/0	5/0/0/1	5/0/0/0
	1/0/0/0	1/0/1/0	2/0/1/1	2/0/1/0	2/0/0/1	2/0/0/0
	5/2/1/2	2/2/1/2	2/1/1/2	2/1/1/2	2/2/1/2	2/1/1/2
	Pioneer DVD-115	Toshiba SD-M1402	Pioneer DVD-105	Pioneer DVD-105	Compaq DVD-114	Pioneer DVD-115
	16x EIDE	12x EIDE	16x EIDE	16x EIDE	10x EIDE	16x EIDE
	Creative	Creative	VideoLogic	Creative	Creative	Creative
	SB Live! Value	SB Live! Value	Sonic Fury	SB Live! Platinum	SB Live! 1024	SB Live! Value
	PC Works Four Point Surround	Cambridge Soundworks Desktop Theatre 5.1	VideoLogic DigiTheatre DTS	Cambridge Soundworks Desktop Theatre 5.1	Creative FPS1000	Altec Lansing ADA 880
	ATi Radeon	Hercules 3D Prophet II	Hercules 3D Prophet II GTS	ATi Radeon	Hercules 3D Prophet II GTS	nVidia GeForce2 Ultra
	Radeon	GeForce2	GeForce2	Radeon	GeForce2	GeForce2 Ultra
	64MB DDR	32MB DDR	64MB DDR	64MB DDR	64MB DDR	64MB DDR
	AGP	AGP	AGP	AGP	AGP	AGP
	Mitsubishi Diamond Plus 9I	Mitsubishi Diamond Plus 91	Mitsubishi Diamond Pro 1010E	CTX PR960F	CTX PR960F	Viglen Envy 19-TF
	19in/18in	19in/18in	21in/19.7in	19in/18in	19in/18in	19in/18in
	1,600 x 1,200/75Hz	1,600 x 1,200/75Hz	1,600 x 1,200/85Hz	1,600 x 1,200/85Hz	1,600 x 1,200/75Hz	1,600 x 1,200/85Hz
	Diamond 56i Pro SupraExpress	SupraExpress ProV CC	Diamond Supra SST 56i Pro DF	Conexant HCF PCI modem	PCI 56RVP modem	Diamond Supra 56i Pro DF
	FireWire PCI host card ATi PCI TV tuner FireWire cable	Hauppauge Win-TV & remote		Hauppauge Win-TV Sidewinder Force Feedback Pro, microphone	TV-tuner card, Saitek R4 Force Wheel & Pedals, MS Sidewinder Force Feedback, joystick, AGFA E Photo CLI8 digital camera	Intel Pro/100VE network connection ATi TV-Wonder Bt878
	MS Works Suite 2000	Microsoft Works 2000, Games software pack	Works Suite 2000, DVD demo disc	Lotus SmartSuite Millennium Edition, Mixman Studio, Rollcage, Aliens vs Predator	Time standard software pack Time executive software pack	MS Work Suite 2000
	1 year on site, 2 years rtb	1 year on site, 2 years rtb	1 year c&r, 2 years rtb	3 years on site	3 years collect and return	3 years on site

Editor's **Choice**

As the previous pages show, some powerful PCs with incredible performance are available today. You could fall into the trap of thinking that because some of them have what appear to be lower scores they are poor performers. This is a myth: every system we tested will more than adequately deal with anything you care to throw at it.

Overall, the results were quite spread out, ranging from the fast to the incredibly quick. Two stand out as running significantly faster than the others, notably the Viglen and the Atlas. Both of these have a GeForce2 Ultra graphics card from nVidia bolted onto their motherboards. If you are an absolute hard-core gamer with a fair bit of cash to spend, then one of these will be your preferred system purely based on the incredible 3D performance these machines can produce. They are state-of-the-art games systems. They did not win awards purely because there are machines that reach a more than acceptable gaming performance for less cash, and are therefore a little better value for money. The hardened gamer may choose not to buy a system with bundled peripherals, in which case one of these Ultra-based machines would be ideal. But for the average prospective buyer money is an issue, so value for money (and extras) become a factor when deciding which PC to buy.

The winners

The decision as to which machine would be the Editor's Choice this month was more difficult than usual. All the systems submitted were extremely fast, so it came down to value for money and features. On this basis, the **Editor's Choice** award goes to the **Systemax P1000RV Entertainment Edition**. This spectacularly large-cased machine is both fast and versatile. With its 1GHz Pentium III, it may not have the fastest clock in the tests, but it's still a very fast chip. The motherboard is an Intel 815E-based AOpen AX3S and with 256MB of SDRAM installed you have all the memory you'll need for the foreseeable future. The hard disk may not be the biggest at 30.7GB, but it'll be a long time before it's full, and the Iomega Zip CD-RW means you can transfer stuff to disc if space does become an issue.

The graphics solution is ATi's Radeon. This 64MB card has the best features of any graphics card currently available. ATi has opted to include hardware environment bump mapping for that bit of extra visual eye candy in games, while still maintaining excellent DVD playback. The card also has video in/out to allow you to pipe your DVD to a television, or to upload video content to the PC. With A Pioneer DVD, the SoundBlaster Live! Platinum and the Cambridge Soundworks Desktop Theatre system, DVD viewing on this machine is extremely well catered for. And as the monitor is a CTX PR960F, if you choose to view the result on the monitor, you won't be disappointed with the image quality. There is also a Hauppauge Win-TV tuner card so you can watch your favourite programmes on your PC. Bundled with a Force Feedback joystick and a few games you really can't do a lot better for £2,231.32 inc VAT.

The first winner of a **Highly Commended** award is the **Mesh Matrix Ultima A1100**, which is incredible value at less than £2,000 inc VAT. Based on the Asus A7V motherboard and with 256MB of SDRAM in support, this PC is powered by a 1.1GHz Athlon processor. It has a 44.1GB UltraDMA100 hard drive, a Pioneer 16-speed DVD-ROM, a Philips CD-RW and a PCI FireWire card (with a cable) also included in the bundle. An ATi tuner card adds TV to the package, while graphics are driven again by ATi's Radeon card. The Mitsubishi DiamondPlus 91 monitor and the PC Works Surround speakers complete an excellent value ensemble.

The second Highly Commended winner is the **Time Machine 1100-7VQ Professional**. Time has put together a bundle that's filled to the brim. With a 1.1GHz Athlon on the Asus A7V motherboard, this system is well stacked. 128MB of PC133 SDRAM is installed, along with a 30.6GB hard disk, a Compaq DVD-ROM and a Teac CD-RW. With PCI slots occupied by a SoundBlaster Live!, a modem and a TV tuner card, and a 3D Prophet II GTS installed in the AGP slot, this system still has two free PCI slots for upgrade. The monitor is a 19in CTX PR960F, and the speakers are Creative's FPS1000. For the gamer, there is a Force Feedback wheel and joystick; and an AGFA E Photo CL18 digital camera is also included in the bundle. All for £1,999 ex VAT.

Systemax's features and value win out

Mesh has included an ATi tuner card

Force Feedback wheel with Time's offering

If you're looking to buy a PDA this is the best place to discover the pros and cons of the 15 palmtops, handhelds and laptop replacements we've put to the test

Pocket

I f you're one of those people who spends a great deal of their time travelling, you've probably considered buying a personal digital assistant (PDA) to store important contact details and to keep track of meetings and events. For many of us, PDAs are becoming essential to help organise our hectic lifestyles.

When you do find the time to nip down to the shops to try one out, you'll most likely be met by shelves awash with a range of devices, each with its own unique features and stylish looks. Some come with built-in keyboards, modems and expansion slots, while others are purely stylus-driven and easily slip into the average pocket. The software varies widely, too.

Initially you have four different operating systems to choose from (EPOC, Palm OS, and Microsoft's WinCE and newer Pocket PC), which all appeal more or less depending on what you intend to use the PDA for. Add to this the fact that a whole host of third-party software houses have got in on the act, and you're presented with almost unlimited options. The one thing you can be sure of is that they all have touch-sensitive screens.

Deciding on the one most suited to you is therefore a tricky task, so in order to hack clear a route through the PDA jungle and help you make the right decision, we have rounded up 15 of these portable pleasures and given them a thorough going over.

Power

contents

• PDAs tested and reviewed by Clive Akass, Jason Jenkins, Gordon Laing, David Ludlow, J Mark Lytle, Richard McPartland, Scott Montgomery, Lars-Goran Nilsson, Julian Prokaza, Nik Rawlinson and Jalal Werfalli

PHOTOGRAPHY HUGH THRELFALL

Casio **Cassiopeia E-115**   *PALMTOP*

QUICK TO TAKE advantage of the success of the WinCE-powered E-105, Casio recently released the E-115 to replace it. Using the same 131MHz CPU, robust casing and TFT display the E-115 is essentially the same as the E-105, but differs in that it uses the Microsoft Windows Powered Pocket PC OS. WinCE 3.0 remains at the core of Pocket PC, but this has been modified with a new graphical user interface tuned to the specific requirements of palmtops. The RAM remains at a decent 32MB, which makes this one of the fastest palmtops here. Like all new Pocket PC devices the processor is backed up by 16MB of application ROM.

In the hand, the E-115 is a little chunky when compared to the slinkier offerings from Palm. In fact it is the biggest palmtop here, measuring 131.2 x 82.5mm (h x w), and boasting a full 20mm depth. It also tips the scales at a bulky 255g but this includes the lithium-ion battery, which has a quoted life of six hours on a full charge. Battery life will vary though if, for instance, you have the screen constantly set at its highest contrast level or use the power save mode.

The casing is very similar to the E-105 with a pewter-type finish and grey border to the screen. Under the display are three application launch buttons giving you one-touch access to the main Casio menu, the calendar and the contacts application. These are joined by a four-way pad used for game playing or navigating icons and menus. Another launch button is located on the left side of the unit, giving a direct route to the

Pocket PC Start menu. All of these buttons are programmable, and so can be used to open any alternative application. An IrDA port is on the side accompanied by a bi-directional selection controller and a button to activate the in-built voice recorder.

The 65bit colour, 240 x 320 resolution active-matrix TFT display provides a bright image and enough contrast to easily read text – a boon when viewing the Cleartype text employed in the Microsoft Reader applet that comes with the Pocket PC OS. In this way, the Casio can be used as an electronic book, albeit displaying only around 100 words at a time. Nevertheless, we could imagine using it on the train to work. Available titles are rather limited at the moment but Microsoft does bundle 29 in the Extras folder on the ActiveSync 3.1 CD-ROM supplied with each Pocket PC.

ActiveSync is the synchronisation program that links Windows-based PCs and the Pocket PC operating system. We had no trouble installing the software, which continuously and automatically synchronises your personal information, keeping everything up to date. Linking this up to a PC, we found that it didn't take long to synch with our Outlook database and transfer our contacts to the E-115. The only gripe we have is that Casio has packaged a serial cradle and therefore data exchanges are slower than the USB-enabled cradles that come with the Visor, Jornada 548 and Compaq iPAQ.

If you're in need of an MP3 player, you have all you need in one handy unit, backed up by 32MB of storage. With the

new Windows Media Player for Pocket PC you can play files in MP3 format as well as asf (advanced streaming format), wma (Windows Media Audio) and wav (waveform) formats. Bear in mind, though, that downloading MP3s over the serial cable does take a while. Although the audio quality produced by the small built-in speaker is rather poor, the stereo output from the earphone jack is good. Extra multimedia offerings can be found on the Casio CD. As well as a demo golf game, this contains copies of Casio's Mobile Video player, Enterprise Harmony 99 and Mobile Camera. The video player lets you play cdf (Casio Digital Format) movies, while Enterprise Harmony allows you to convert PIM (Personal Information Manager) data from a Palm to the Cassiopeia. Mobile Camera supports Casio's optional digital camera card that slips into the Compact Flash (CF) slot located at the top of the E-115.

This slot supports both Type I and Type II CF devices, which means more expansion with the possibility of using Compact Flash modems, Ethernet cards and hard drives such as IBM's 340MB Microdrive module. Plug in one of those and your MP3 library will have a second home.

On the right-hand side you'll find the rather non-descript stylus, which can be used to tap around the icons, scribble notes or tap on the graphical Qwerty keyboard. With the extra speed the E-115 packs in we found it could easily keep up with our stylus movements, but using the text-recognition software did slow things down somewhat.

Overall we are fairly impressed by the Casio, and especially with its multi-media functions. All this comes at a price, though, and some may not want to fork out £499 for a PDA that would stretch most shirt pockets. On the other hand it has expansion possibilities, is easy to use, and is pretty fast.

JALAL WERFALLI

DETAILS

PRICE £499 (£424.68 ex VAT)
CONTACT Casio 020 8450 9131
www.casio.co.uk
PROS Nifty processor; 32MB of RAM; Compact Flash slot; excellent display and stereo sound
CONS Serial cradle; fairly bulky and a tad overpriced.
OVERALL Sticking with a formula that worked for the E-105, Casio is hoping that the new Pocket PC-driven E-115 will fare even better than its illustrious predecessor. However, its pricing and size may hold it back

FEATURES	★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Compaq **Aero 1550**

PALMTOP
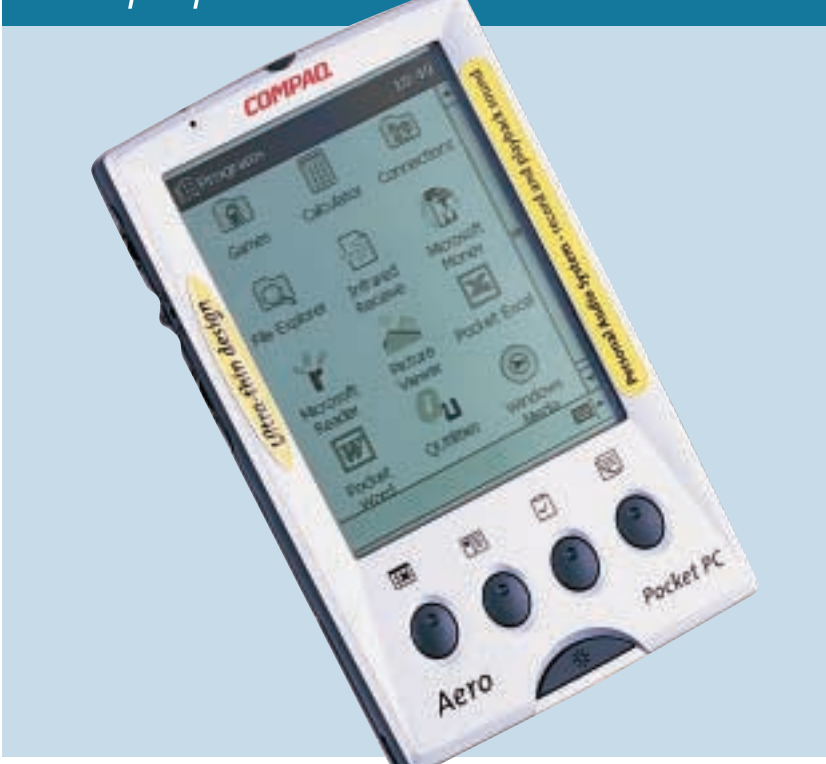
IN THE RUSH to get machines to market, Microsoft's Pocket PC launch partners were, to be honest, a little unimaginative. Take Compaq, for example. While its recently released iPAQ has all the bells and whistles to get the very best from the OS, in contrast the Aero 1550 looks and acts (and to all intents and purposes is) exactly the same as earlier Aeros that shipped with Windows CE. That's not to say it's an awful machine – far from it. As with all the other units on test, it all depends what you want from a PDA.

OK, it won't win any design awards – but the sleek silvery casing does the job and as it measures just 130 x 79 x 12.7mm (h x w x d) it'll fit nicely into a bag or even a pocket. At last, a true, 'pocket PC'. It's also one of the lightest machines on test, weighing in at just 150g (battery included). Of course, looks alone do not a great machine make. Luckily, the 1550 also has a respectable specification to match with a 70MHz MIPS R4111 processor and 16MB of RAM under the hood. It might not be the most powerful unit on test but the fact remains that it runs the OS perfectly well.

Unlike newer Pocket PCs, the Aero has a mono screen with a 4.02in viewable diagonal. This is capable of displaying 16 greyscales. There's also a backlight with two settings ('ambient' and 'on', the former of which is a half-strength light) and this illuminates the display effectively. Truth be told, we'd rather play a game of golf where the green is, well, green, regardless of how

quickly our batteries drained, but as a budget choice the 1550 is hard to beat.

Elsewhere the Aero boasts the standard compliment of programmable buttons, although the fact that there's no joypad-style directional navigation pad means playing games isn't as easy as on, say, the Cassiopeia. The Aero's stylus is a sturdy number, held conveniently out of harm's way in a slot that runs from the top of the unit down the back. When compared to the 'coffee stirrer' that comes with HP's Jornada, we know which we'd prefer using on a day-to-day basis.

The unit's Type II Compact Flash slot is conveniently located at the top of the machine, and this provides access to a wide number of peripherals as well as storage cards. However, before you plug in your card make sure you remove the 'dummy' card provided to prevent damage to the slot. There's also an IrDA port for transferring files to other PDAs or notebook computers.

When it comes to battery life, the benefits of running a monochrome screen are clear. Compaq claims the unit can eek 14 hours of normal usage from a full charge of the 1,000mAh lithium-ion battery, which is hidden behind a compartment at the base of the unit. In our tests we just about met Compaq's target. Compare this to the eight hours promised by most colour PDAs. There's also a backup battery to provide some data security should your main battery run dry.

Recharging the unit is a simple matter of popping the Aero into its

cradle and then plugging in the AC adaptor. You can also charge the unit independently if you so choose. The cradle allows you to synchronise data with or even back up your device to your desktop PC. Unfortunately the serial lead is moulded into the cradle itself, so if it gets damaged you'll need to shell out for a completely new cradle. When it comes to transferring data, the unit relies on the latest version of Microsoft's ActiveSync software, which is simple to use and easy to set up to meet your requirements.

Like most other Pocket PC manufacturers, Compaq has provided its own utilities to fill what it considers to be gaps in the Pocket PC OS. In Compaq's case this means QMenu and QUtility. The former allows you to switch between tasks, close programs, adjust settings and check on your battery life. The latter includes system diagnostics, the ability to change application button functionality and a handy utility to back up your device to Compact Flash cards. There are also a number of viewing utilities, calculators and the like on the CD-ROM that comes with the machine.

Overall, the Aero is hard to fault. It's a handy, compact machine that brings you all the benefits of the Pocket PC operating system at a (comparatively) reasonable price. This said, running the OS in monochrome seems a bit of a waste. If you just intend using the device for contacts and the like, you may as well go for a cheaper system as it will probably suit your needs just as well. If it's a Pocket PC device you crave, it could be worth going the extra mile for a colour screen. It's also worth pointing out that with quite a few applications onboard, the Aero 1550's system does slow down to a crawl (particularly when you're multitasking). Although it's easy enough to uninstall some of your least used programs, if you see yourself as a power user then going for a 32MB device would be a better bet.

RICHARD MCPARTLAND

DETAILS

PRICE £269.08 (£229 ex VAT)
CONTACT Compaq 0845 270 4000
www.compaq.co.uk
PROS A competitively priced Pocket PC system; slimline unit
CONS Not a machine for power users; monochrome screen doesn't get the best from the Pocket PC OS
OVERALL This is a machine for the non-demanding user who likes what the Pocket PC OS can offer but doesn't want to shell out excessive amounts of cash

FEATURES	★★★
EASE OF USE	★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Compaq **iPAQ H3630**

PALMTOP

PROBABLY THE MOST distinctive palmtop, the iPAQ H3630 doesn't fail to turn heads. The slender silver and chrome case is definitely pleasing to the eye, while its size just passes our coat and shirt-pocket test. Not everything about the iPAQ is about aesthetics though. Beneath the hood is Intel's beefy 206MHz StrongARM SA-1110 RISC processor – equivalent to that found in Hewlett-Packard's Jornada 720. This is backed up by a full 32MB of RAM making this, at least on paper, the quickest Windows Pocket PC here.

To test its speed and multitasking abilities a copy of Pocket TV was loaded from www.mpegtv.com allowing us to play mpeg files. This didn't trouble the iPAQ, so to make things a little trickier we triggered an MP3 to run in the background. Impressively the iPAQ could handle both at the same time. An added bonus is that you can upgrade the operating system when new versions become available. This is because the OS is stored in the flashable ROM. It also means you don't have to use the Pocket PC OS, with some users already trying out Linux on their iPAQs.

The unit isn't boxy and possesses rounded sides that feel very comfortable in the hand. The metal front gives the device an element of quality and robustness. It is a shame that the plastic back doesn't get the same treatment. Nevertheless, this does keep the weight down to 190g – lighter than its closest rivals, the Casio E-115 and the HP Jornada 548. The layout of the buttons is well thought out, too, with most positioned on the front of the unit, except

for the voice recorder button located on the left side. The four-way control pad can also be pressed to select items and doubles up as the speaker unit.

The sound quality from this is OK but plugging a pair of headphones into the 3.5mm earphone jack will do your MP3 collection more justice. The on/off button is in the top right-hand corner and if held for a second or so switches on the backlight. The remaining four buttons are application launchers that are now a familiar sight on the majority of Pocket PCs. These launch the calendar, contacts, program menu and Compaq's own quick-launch utility.

Along the top of the H3630 are the stylus silo, stylus eject button, IrDA port, microphone and 3.5mm earphone jack. On pressing the eject button, the stylus tip pops up allowing it to be easily slipped out. One note though: the stylus is asymmetrical so should only fit into the silo one way, but it doesn't. In fact, it is possible to slide it back incorrectly, causing it to get stuck. If you fall victim to this minor design fault, you'll need a good pair of fingernails to pull the stylus back out. The IrDA is in our preferred 'top' location and is good for connections of up to 115Kbits/sec.

Compaq has not built in an expansion slot, but instead has included a socket designed to interface with its own expansion packs, which are available as optional extras. These are Compaq's answer to the Springboard modules designed for the Handspring Visors. Currently there's a choice of two packs (also known as jackets) – the PC Card and battery combo (£76 ex VAT)

and Compact Flash card module (£31 ex VAT). These jackets slot over the back of the iPAQ and grip its sides, making the device a little bit larger. Nevertheless, these do promise to diversify the H3630's role in terms of storage and connectivity, and should let it take advantage of future technologies such as GPRS and Bluetooth.

The touch-sensitive TFT LCD screen has a resolution of 240 x 320 pixels and with the backlight on it looks great. Contrast is also good and we were able to read it outside in the sunshine. In addition, Compaq has built in a unique ambient light sensor that automatically optimises the brightness and contrast of the display. The screen only has 4,096 colours while the Casio can handle 65,000. This is not a major niggle but the display on the Casio does look a little richer.

Resembling a horse's hoof, the cradle complements the iPAQ perfectly and is USB-enabled for faster data transfers and tight synchronisation using Microsoft's ActiveSync 3.1. Two stylus holders are also positioned on its front, but you have to question the need for these. Still, it's another design touch indicating Compaq's attention to detail.

In terms of software the usual Pocket PC programs are present, together with some of Compaq's own custom applications: QUtility, QStart and Picture Viewer. QUtility is a suite of utilities that let you backup or restore to a CF card, run system diagnostics, reassign the application buttons and adjust the screen contrast. QStart is a handy application that enables users to create a customisable menu, while Picture Viewer lets you display jpeg and bmp image files.

In summary, the Compaq iPAQ H3630 has been one of our favourites since its launch. However, supply has become limited as a result of high demand and if you can get your hands on one then consider yourself lucky. We have been informed that Compaq plans to release another wave of iPAQ handhelds in the coming months.

JALAL WERFALLI

DETAILS

PRICE £448.85 (£382 ex VAT)
CONTACT Compaq 0845 270 4000
www.compaq.co.uk
PROS Pleasing aesthetics; fast processor; quality screen and flashable ROM
CONS No built-in expansion slots; asymmetrical stylus can get stuck
OVERALL Excellent design and performance – the only downfall is the bulkier jacket expansion system that comes as an optional extra

FEATURES	★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Handspring **Visor Deluxe** *PALMTOP*

THE VISOR'S GENERAL layout is rather similar to that of the Palm models. This isn't surprising since the Handspring company was set up by Jeff Hawkins – who started Palm Computing in 1992 – and Donna Dubinsky (former CEO of Palm Computing). In 1999, they launched the Visor line of PDAs. These include the Visor Solo, which has 2MB of RAM onboard and comes without a cradle; the Visor, which includes a cradle; and the Visor Deluxe, on test here, which comes with a USB cradle and 8MB of memory. The ROM remains at 2MB in each case. The Visor we tested was called the 'Ice' flavour, but the unit is also available in translucent blue, green, orange and an opaque graphite. The CPU is a 16.6MHz Motorola Dragonball – identical to that in the Palm M100 and IIIe.

The Visor comes with a protective cover that easily snaps on and off. This protects the backlit LCD screen and the HotSync port. Underneath the cover is a power switch, four application buttons and up and down scroll buttons, all sitting in the familiar Palm positions, hinting at the Visor's heritage. Upon closer inspection, the power button has a small green dimple on its surface allowing the user to activate the unit using the stylus. Indentations are present on the other buttons, too, except the ones used for scrolling. As with other Palm OS devices, if the ambient lighting becomes too low you can hold down the power button to activate the backlight. However, this works by reversing black characters into

a blue-green colour for a 'negative' appearance. This is fine at night but when some lighting is present it tends to make things harder to read. We would have preferred it if Handspring had chosen the more standard 'positive' backlighting as seen on other PDAs. The buttons themselves all respond positively when pressed, making an audible click to indicate that they have been operated.

The chrome and plastic stylus is located to the right side of the unit and slips smoothly out of its home. On first inspection this looks like any other Palm stylus but after a little fiddling we found that both ends screw off to reveal some useful tools. At the nib end is a small plastic prong for pressing the reset switch on the back of the Visor, while at the top is a small screwdriver for opening up the case. As for writing on the screen, it is the same as the Palms. The Graffiti area where you write the characters is also similar, although beside the Menu icon is a small half-shaded circle that, when tapped, invokes the contrast adjust application. Overall, the Visor's display is clear in good light and comparable in terms of sharpness to other monochrome screens.

Around the back of the unit, you'll find a compartment for two AAA alkaline batteries that should last for up to one month depending on use. Handspring also includes an infra-red port for sending and receiving data from other IR-enabled Palm OS devices. If you want to use the IR for HotSyncing you'll need the help of third-party software, or otherwise use the USB

cradle. For those without a USB-configured PC a serial cradle is available for around £25 ex VAT.

Moving the IR port over to the left side has allowed Handspring to accommodate the Visor's unique selling point – the Springboard slot. Positioned at the top, this 68-pin connector accepts the range of Springboard modules slowly filtering onto the market. These include an 8MB memory expansion module, a backup module, a digital camera and a golf game. When they become available, it will also accept an MP3 player, GPS receiver, Bluetooth and modem modules. These are hot-pluggable, and range in price from £118 for the EyeModule digital camera to £30 for the backup module, all ex VAT. You may question the need and price for some of these but there's no denying that the Visor is multipurpose. It remains to be seen how end users pick up on this technology.

Each Springboard module works with the Visor's version 3.1 Palm operating system. This version lacks some of the features of 3.3 and 3.5, such as support for colour screens, and since the Visor doesn't use Flash memory you can't upgrade it. However, Handspring has included some little extras, such as Datebook Plus, Advanced Calculator and CityTime. The Visor Desktop application is largely the same as Palm's software but has been tweaked to include support for the Mac and, of course, USB synchronisation. This means that your diary, contacts database or emails can all be uploaded directly to the Visor without too much of a problem.

On the whole, at £199 inc VAT the Visor Deluxe represents good value for money. For £50 more than the Palm IIIe you get a USB cradle for faster synchronisation, four times more memory, and the promise of multifunctionality thanks to Springboard. All in all, a decent PDA that's definitely worth a closer look.

JALAL WERFALLI

DETAILS

PRICE £199 (£169.36 ex VAT)
CONTACT Handspring
020 7309 0134
www.handspring.com/uk
PROS Expansion possibilities; decent value; USB cradle and a neat little stylus
CONS Lack of Flash memory for OS upgrades; limited infra-red
OVERALL If you're looking for a pocket-sized organiser that has the potential to be a lot more, then you should consider checking out the Visor Deluxe

FEATURES	★★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★★

HP Jornada 548

PALMTOP

WE FIRST TOOK A look at the Jornada 545 in our July issue. The 548 is identical to that unit, but comes with 32MB of memory rather than the 16MB in the 545. HP was the first manufacturer to have an entirely new Pocket PC available at the launch of Windows CE 3.0. But even now that we've had a chance to take a look at the competition properly, we're still impressed. The 548 runs the palm-sized version of Windows CE 3.0. HP has customised this slightly, and solved the few problems we had with the basic version. It is much easier to manage the available memory, for example, the HP task switcher can be used to close down open programs much more easily than going into the system settings. HP has shunned Microsoft's Today screen in favour of its own Home Menu (although the Today screen is there if you want to use it). The Home Menu consists of a series of program shortcut icons to stop you having to go through the Start Menu, and speeds things up a bit.

Underneath the casing sits a 133MHz Hitachi SH3 processor that keeps everything moving at a usable pace, and the 32MB of memory is a good amount for the OS. The display looks very impressive. The 240 x 320-pixel backlit screen is extremely clear, with the pixels very finely defined. Text is extremely easy to read, and programs that make good use of colour look excellent. The screen itself is capable of displaying 16bit colour, but unfortunately the graphics chip inside the 548 can't support this, effectively making the image a 12bit

imitation. This fact only came to light after the launch of the 540 series, but it will only affect a small number of people. If you want to view high-quality colour images on your pocket PC, though, you'll need to look elsewhere. The backlight automatically dims after a user-defined period to extend battery life, which is quoted as eight hours.

On the side is a scroll/action wheel – this rocks up and down to scroll through the current window or menu, and you can press it inwards to select the current highlight. A button for recording memos is situated below. This is much more difficult to press accidentally than that on the previous Jornada, and is recessed. An IrDA infra-red port has been placed at the top left of the device, and next to this is a Type I Compact Flash slot. Ideally, we would prefer to see a Type II slot for IBM's Microdrive, but it is difficult to see how HP could have achieved this and still maintained the Jornada's thin form factor – the device is, after all, only 16mm wide. A headphone jack is provided next to the Flash shot. Four customisable hot keys are positioned on the front of the device, and these open up the most frequently used applications.

It is very easy to connect the device to your PC. Both serial and USB cables are supplied as standard. Fitting the Jornada into the supplied docking cradle automatically syncs it with the PC, depending on the options you selected when setting up the ActiveSync software. You can also plug the cradle into the mains to recharge the batteries at the same time – a very useful feature.

One of the most noticeable features of the 548 is the lid, which does not fold flush with the rear of the unit, something that we don't like, but this does have the advantage of shielding the fairly reflective screen from lights. If you don't like it, it is easily detached, but then the screen won't be protected from knocks and scuffs. The lid is also the repository for the stylus. We don't like the stylus – it is about the same weight and consistency as an average coffee shop disposable spoon. Some people do like it, though, and its lightweight nature keeps the unit's overall weight down, so maybe it's more a matter of taste.

HP has provided a massive amount of software that covers most of the conceivable uses of this device. In addition to the standard Pocket PC software, such as Outlook, Word, Excel, Internet Explorer and Media Player, HP has thrown in other programs including MusicMatch Jukebox 4.4, AudiblePlayer 2.0, PhatWare HPC Notes 3.03 Lite and ZIO Golf.

Compared to the other three Pocket PC devices on test, this one has some unique selling points. The iPAQ seems to run a little faster, but crucially does not have the expansion potential of the 548. The Compact Flash slot on the Jornada allows you to connect a multitude of products, and the fact that it is situated at the top means that it will be able to take protruding Compact Flash cards. If you want the extra functionality of Pocket PC, such as Media Player, Internet Explorer and Microsoft Reader, then the 548 is impressive enough underneath to deal with it. Syncing with Microsoft software, especially Outlook, is straightforward, and you'll even be able to play games.

There is no such thing as a perfect PDA. In an ideal world, we would like to have seen a true 16bit display and a Type II Compact Flash slot, but you can't have everything. If you are after a new Pocket PC, the HP Jornada 548 is a capable unit that meets the demands of the intensive OS, and is positioned at a very attractive price.

JASON JENKINS

DETAILS

PRICE £439 (£373.62 ex VAT)
CONTACT Hewlett-Packard
0990 47 47 47 **www.hp.com/jornada**
PROS Good screen; responsive; good synchronisation with Microsoft software; expansion potential; slimline
CONS The lid and stylus will annoy some
OVERALL A well-designed, expandable PDA that shows off Pocket PC to the full

FEATURES	★★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★★☆
OVERALL RATING	★★★★★

HIGHLY COMMENDED PERSONAL COMPUTER WORLD

Palm m100

THIS PEN-DRIVEN palmtop neatly encapsulates Palm's design philosophy, which is to offer no-brainer organiser applications in a compact device you can carry unnoticed in a handbag or a jacket pocket.

It is pitched to challenge Handspring's Visor, which has been eating into Palm sales at the cheaper end of the pen-driven handheld market. The Palm m100 boasts 2MB of RAM and uses the Graffiti handwriting recognition system running on the hugely successful Palm OS.

The m100, at 118 x 79 x 18mm (h x w x d), is almost exactly the same size as both its Palm IIIe stablemate and the Visor, which are roughly in the same price bracket. However, it looks smaller because it is more streamlined, narrowing slightly at the waist to fit snugly into the hand. It is also 40g lighter than the Visor, a significant difference in a device you are likely to carry around all the time.

Less happily, its 50 x 68mm screen is appreciably smaller. Palm says a higher resolution compensates for the screen size and indeed the definition is good in a variety of lighting conditions. But small type, however crisp, is hard to read and there is no way to increase the size of the characters.

This will not bother clear-sighted people so much, but the m100 is not a device you should give to your grandmother. Even people with good eyes might baulk at using the screen for long, which rather limits the m100's potential as a word processor – a task otherwise perfectly possible with the aid of a slot-in keyboard. This is why we have given the m100 a relatively low ease-of-use rating.

A fragile-looking black lid protects the screen and flips back out of the way, flush with the rear. A scroll-button, accessible through a hole in the closed flap, brings up the time in a small viewing window. An infra-red port, next to the hinge on the upper edge, can be used to exchange electronic business cards and other information.

The face panel on the review machine was blue, but you can buy clip-on panels in other colours (silver mist, green mist, Pacific blue, ruby pearl) but at £19 inc VAT they are not cheap.

Beneath the lid is the familiar Palm layout: a screen divided into writing and display areas, below which are arrayed two scroll buttons and four application buttons. By default the latter access the appointments, address book, to do list, and a new NotePad that allows you jot down names and numbers without having to resort to the handwriting recognition system.

The buttons are easily configured to link up to other applets, though the m100 lacks the expenses and email apps of its more expensive stablemates. Just above the screen is the power-off button, which when held down switches on the backlight. To the rear of the device are a pinhole reset, a slot for the stylus and a bay for two AAA batteries.

Unlike the Palm IIIe the m100 does not come with a HotSync cradle by default. Instead you get an RS232 serial cable with software that syncs with Microsoft Outlook. This is simple to use but less elegant than the cradle, and more daunting for non-techies. You can buy a cradle for £28 inc VAT but the fact that you need to makes the m100 look poorer value than the Palm IIIe, putting it on a par with the Visor. The m100 comes with link software for the Mac but you need to buy an RS232-to-USB adaptor, which costs £35 inc VAT.

The RS232 link slots into a port on the lower edge of the m100. The port is uncovered, exposing the contacts to dirt and the weather, and it is not compatible with other Palms. This could be a bad mistake: a Pilot-owning user thinking of buying an m100 for a partner could not share peripherals and would have no reason not to look to Handspring instead. Visors, with their Springboard ports, are also designed from scratch for expansion. This is particularly important because any organiser bought now will date quickly when the emergence of Bluetooth connectivity finally allows the PDA to consummate its marriage to the mobile phone. By then the m100's RS232 link could look like something out of the Stone Age. Moreover, m100 owners will have to wait for peripherals to emerge. A fold-up keyboard is imminent, with a modem to follow.

The simplicity of the m100 is an asset in a mature market in which buyers, unlike early adopters, are not necessarily gadget freaks and may even be technophobic. Most are looking simply for the electronic equivalent of a Filofax, and in this the m100 should serve them well. It also has the looks to appeal to users who like their personal organisers to double as a fashion accessory.

However, many buyers of this ilk do not understand the need to back up a palmtop, as it can lose its data if you forget to change the batteries. There is currently no way of giving the m100 non-volatile storage, so users who do not own a PC or a Mac are at constant risk of losing all their information.

CLIVE AKASS

DETAILS

PRICE £130 (£110.64 ex VAT); cradle £28 (£23.83 ex VAT); extra face plate £19 (£16.17 ex VAT)
CONTACT Palm 020 7365 9820
www.palm.com
PROS Has most of the features that made Palm a market leader
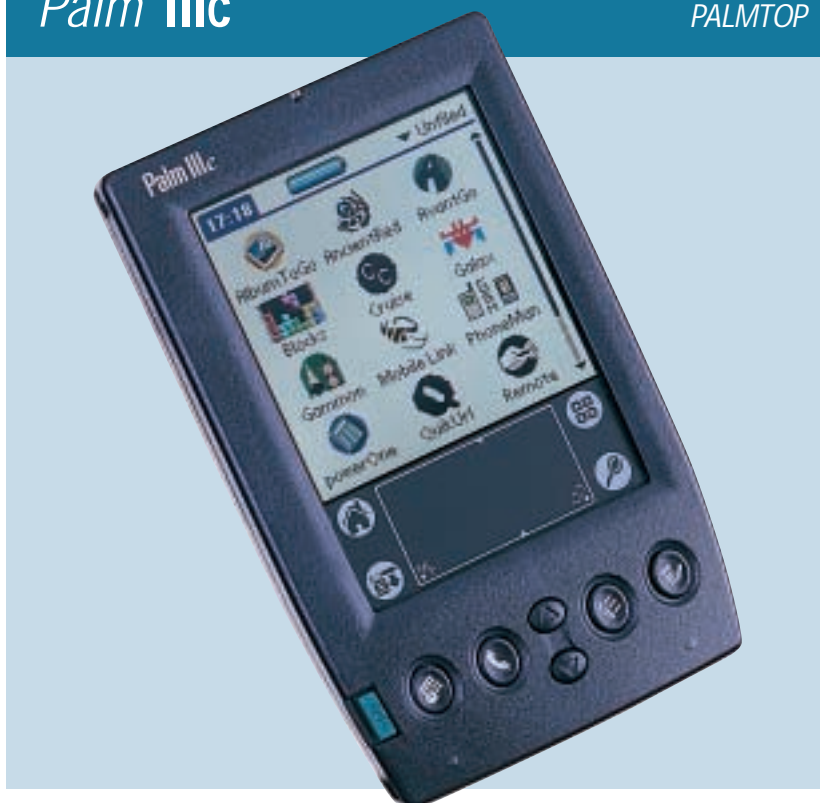**CONS** Cradle not included in bundle; poor future-proofing; incompatible with other Palm peripherals; small screen
OVERALL Elegant, simple organiser but, technically, not as good a buy as major rivals

FEATURES	★★★
EASE OF USE	★★★
VALUE FOR MONEY	★★
OVERALL RATING	★★★

Palm IIIc

THE PALM IIIC was the first device based on the Palm OS to boast a colour display. Even though the Palm platform was not originally designed for colour, it does have its advantages. You won't gain much with a colour display, but it brings the Palm OS into the 21st Century and it might just appeal to enough people who prefer a colour device but don't get along with the Pocket PC range.

The IIIc is not very different from the Palm III except for details like the 8MB of memory and a built-in rechargeable lithium-ion battery. The unit's integrated battery and charging circuitry mean that the IIIc is slightly longer than the monochrome Palm alternatives. The charger that is shipped with the European version of the IIIc includes several different detachable power plugs, enabling it to be used in several European countries as well as in the US and Australia. However, you cannot use the charger as a standalone power supply. Instead you have to connect it to the serial cable on the HotSync cradle, so this is hardly the best solution if you travel a lot.

The biggest difference between the IIIc and the Palm III is, of course, the TFT colour display, capable of producing up to 256 colours. Now this might not sound very good compared to some Pocket PCs that can display 65,536 colours, but it doesn't seem to let the IIIc down in any way. The unit has excellent contrast as well as backlighting and you should be able to use it under most conditions. You can even adjust the brightness – just hold down the

power button for a few seconds and a slide bar appears on the display. The stylus isn't wonderful, but it does an adequate job and has a good overall feel.

The IIIc comes with the standard hard plastic lid and a serial docking cradle, though this particular one is not compatible with previous models because it has the built-in battery charger. The manuals supplied with the IIIc are excellent; a getting started guide covers basic functions as well as how to connect the IIIc to your PC. The 200-page handbook, on the other hand, covers every aspect of the IIIc in detail. It is very clearly written, though, and you shouldn't really require any previous knowledge of the Palm OS. There are instructions on how to set it up to sync with all kinds of applications on your desktop PC as well. Syncing the IIIc couldn't be much easier – simply install the supplied software on your PC, reboot and then press the sync button on the docking cradle.

It also has some tips on how to get a grip on Graffiti, the input language of the Palm OS, which can be a bit confusing to start with since it is a simplified alphabet. In general, what it means is that some characters have been simplified or have to be written in a specific way. But don't despair, help is not far away as Palm has supplied a pocket guide as well as a couple of stickers that you can attach to the lid of the IIIc to give you an overview of the Graffiti alphabet. The only letter that is a bit of a nuisance is h, since it's the only one that is written in lower case.

The software bundle is hardly overwhelming, as it is exactly the same package that comes with the rest of Palm's PDA range. The only difference is the OS, 3.5, which is the only version to support colour, and also makes an appearance on both the Vx and m100. The applications that come as standard on the IIIc are an address book utility, calculator, organiser, expense book, memo pad and a to do list utility.

If you want more software for your IIIc there's plenty out there. A variety of software titles are available for the Palm OS, either as shareware or freeware, or to buy or download from the Internet. Websites such as www.tucows.com, have thousands of titles to choose from, while Palm's own site has a comprehensive list of related websites and links to software developers. The majority of software has been developed for older versions of the Palm OS and do not come in colour. However, Palm has addressed this issue by including colour support in version 3.5 of the Palm OS, which in turn has led to an increase in available colour programs.

The colour screen comes into its own for games. There are some excellent choices available and not even the Pocket PCs have anything as good. One game we have to mention is Ancient Red. This is like a pocket version of Diablo and has excellent graphics. It's available for download at www.palmblvd.com.

Overall, the IIIc is an excellent PDA, even though it can't compare in terms of speed to something like the Compaq iPAQ, which is 10 times faster at 206MHz. Here, you're running a 20MHz Motorola Dragonball CPU, which might lead you to assume that the IIIc is a poor performer, but it's quite the contrary – most applications start as soon as you tap the icon with the stylus and we haven't experienced any slowdown whatsoever, even when running multiple applications.

At the end of the day, if you want a colour PDA the IIIc is a very good choice, except that it is a bit on the pricey side.

LARS-GORAN NILSSON

DETAILS

PRICE £320 (£272.34 ex VAT)
CONTACT Palm 020 7365 9820
www.palm.com
PROS Colour display; long battery life; robust OS
CONS Price
OVERALL Palm's range of PDAs is easy to use and the IIIc gives you a few added bonuses, but it doesn't really add much to an already good platform except for the colour display

FEATURES	★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Palm IIIe

WEIGHING IN AT a mere 170g and sporting a see-through body, the IIIe is Palm's second cheapest entrant in this group test at £149.99 inc VAT. The unusual look of the unit will appeal to some and be loathed by others – the influence of the iMac seems to pervade everything these days.

Under the clear plastic flap that protects the screen, you have something akin to a communicator from the original *Star Trek* series. Unfortunately the angle the cover opens up to is a little bit irritating, making the unit feel bulkier to handle and a little flimsy. The flap can be forced with an alarming click to a less precarious and more open position, although the flimsiness is still evident. Thankfully the whole flap can be easily unclipped to give a more compact overall device – albeit with no screen protection.

One of the more useful features of the casing is a spring-back cover to protect the connections for the HotSync cradle from damage from the elements, ensuring dust build-up does not occur on the terminals. This is a good feature, and one that would have benefited the screen contrast wheel, which is sited on the side of the unit. This wheel seems to constantly need re-adjustment because its position means it is frequently being knocked, despite being slightly recessed. The wheel was extremely sensitive – we assume this to be an idiosyncracy of the test unit, rather than a reflection of the IIIe series as a whole.

Two AAA batteries power the IIIe, fitting into the back. At the top of the back is the infra-red port for 'beaming'

information to and from the unit. The stylus is little more than a miniature pen-shaped piece of plastic that slots into the top rear of the body.

The screen on the IIIe is split into a large viewing area and the bottom quarter is reserved as the Graffiti writing area – letters are written on the left and numbers on the right. Holding the on/off button after the unit is switched on activates the backlight to allow use in poorer lighting conditions. Quick Launch buttons for the organiser, address list, to do and memo lists are situated at the bottom, with the on/off switch to the left and a scroll button sitting in the middle.

There is no getting away from the fact that the screen is small, and along with the difficulties of keeping the contrast set, was not the easiest display to view. The resolution is 160 x 160, and the overall effect is a pretty grainy picture. The program menu is made up of icons that allow access to the various applications with a press of the stylus (or through the quick-launch buttons). With the IIIe, as with all Palms, learning the Graffiti writing style is a necessity. A tutorial program allows you to practise writing, and stickers are supplied to place on the screen cover to remind you of the specialist shapes of each letter. Learning Graffiti is a fairly quick process – at least learning the basics is – and it allows the unit to be used efficiently. The more complex characters will take a while to learn, though.

Getting started with the IIIe is a simple process. A quick-start reference card gets you up and running in next

to no time, while for the hardcore enthusiast a thick manual covering every aspect of the Palm operating system is included. The IIIe runs version 3.1.1 of the Palm OS.

To make sure your IIIe's details are up-to-date with your PC, a HotSync cradle is included with the unit. This plugs into a serial port in your PC (both nine-pin and 25-pin serial sockets are catered for). After simple installation of the supplied software, you just slot the IIIe into the cradle and press the button. An electronic melody tells you when it is connecting and when it has updated. The PC software can also be used to install further applications onto the unit. Simply download the required program to your PC from the Internet, then click the install button in the PC software and it will transfer to the cradled IIIe, adding the relevant icons to the program menu.

With 2MB of onboard RAM and ROM also amounting to 2MB, the IIIe sometimes got bogged down, with the stylus having no effect when we wanted to select or move from a given program, which is unfortunate as there is no possibility of a memory upgrade. After a brief spell, the system seems to get over the backlog and normal service resumes.

With most of the installed programs fulfilling the role of a small organiser, the IIIe will appeal to the gadget lover who doesn't want to break the bank and wants an electronic Filofax. With dimensions of 119.8 x 81 x 17.7mm (h x w x d) it will easily fit into a pocket and it has all the functions you'd expect from a small organiser. With a question mark over the build quality, it does seem expensive for what it is. However, the ability to download and install mind-numbingly addictive games like HardBall (the one where you bounce a ball and destroy bricks on a wall) will certainly give a disgruntled executive on the train something to occupy their mind. Overall, though, there are far preferable, albeit more expensive PDAs that are much better to use and which have displays that are easier to view.

SCOTT MONTGOMERY

DETAILS

PRICE £149.99 (£127.65 ex VAT)
CONTACT Palm 020 7365 9820
www.palm.com
PROS Compact design
CONS Screen protection flap is flimsy and sits at an awkward angle
OVERALL May be worth the money, although the build quality isn't wonderful. If you require a PDA there are better ones, although they cost more

FEATURES	★★★★
EASE OF USE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Palm Vx

PALMTOP

WHEN US ROBOTICS first made the Palm, the industry was half expecting a failure the size of the Apple Newton. Fortunately, the Palm arrived with a simple interface and data entry that was similar to handwriting. Since then Palm's been bought by 3Com, and then spun off into its own company to face the assault of Microsoft and Psion. So, can the latest release, the Vx, still cut it?

Fortunately for Palm, the answer seems to be 'yes'. Externally the Vx is the identical twin of the much-loved V. It's the size of an average pocket diary, in height, width and, more impressively, depth. Weighing just 120g, its monochrome screen affords a normal-use battery life of one month. This kind of practicality gives the Palm a clear advantage over Pocket PCs. But it's not just this that wins you over, as the Palm Vx is designed to look attractive. A sleek brushed metal case makes sure that the unit is tough enough to be carried around all day and a leather flap folds over the screen to protect it.

The flap is designed to slide into a groove on either side of the Palm, which makes it suitable for left- or right-handed people. Whichever slot remains free then houses the stylus. Even this has intelligence built into it, as the end unscrews to reveal a pin that can be used to reset the Palm in the unlikely event of a crash. While this design remains the same as the Palm V, there's a lot more going on under the cover.

The first major change is an upgraded 20MHz Motorola EZ Dragonball processor. It may sound a little weedy compared to the quoted specs of other products, but for the Palm platform it's actually very nippy. Installing anything more than this would just be a waste. A more significant upgrade comes from the 8MB of memory – up 6MB from the V. This is a godsend when the Palm is being used to store email, as 2MB is easily eaten up.

Beyond the design and specs, usability can make or break a PDA. Fortunately, Palm has worked hard on this, and the simplistic interface has endeared it to users who would usually run screaming from a computer. The Palm Vx comes installed with Palm OS 3.5. New features include a smoother-looking interface, a more intuitive menu system and an optimised synchronisation system. Other than this, the basic system remains the same, with navigation performed through a combination of a stylus and a touch-sensitive screen.

Applications are launched from icons in the workspace, or for easy access the most common ones – calendar, address book – have shortcut buttons built into the Palm's case.

Once inside an application any data entry is performed using the Graffiti system. This is similar to handwriting, but it does require characters to be formed in a specific way, and in a specific area of the screen. A box located at the bottom is divided into two entry areas: one for text and one for numbers. In this way, the Palm knows exactly what kind of data is being entered. Granted, this all takes a little while to get used to, but it does soon become second nature.

Alternatively, you can buy a standard keyboard that plugs into the data connector at the bottom of the unit. Keyboards aren't the only devices capable of using this interface. Other peripherals, from a modem to a Compact Flash reader, are also available. More usually, this interface is used for the cradle that charges the battery and sychronises data on the Palm with a PC. Through the HotSync software, applications and information can be exchanged with a desktop computer.

Out of the box, Palm offers two choices for storing data: Microsoft Outlook or the Palm Desktop. We prefer Outlook, as the Desktop is a bit basic and can't be used as an email client.

The only complaint we have is that it's difficult to switch from using the Palm Desktop to Outlook, or vice versa should the need arise. The Pocket Mirror software allows greater control over the synchronisation process, but it's still a pain to perform the actual switchover. If you're a Lotus Notes user, though, don't feel left out as Lotus sells a piece of software called EasySync to allow the Palm to talk with Notes instead.

Synchronisation isn't the only method of communication. The Palm has an infra-red port at the top of the device, which can be used for transmitting data such as electronic business cards. This is even compatible with the system used by Nokia mobile phones. Not surprisingly, the infra-red connector can also be used to make dial-up connections through mobile phones. Palm has worked hard to provide a larger range of connection software, and a full web browser is now available.

Maybe the Vx doesn't have a colour screen, or the capability to play MP3 files, but then it doesn't really need it. The Palm does one job, and it does it very well. With support from thousands of developers, and a superb interface, you can't go wrong with one of these devices in your hand.

DAVID LUDLOW

## DETAILS

PRICE £299.99 (£255.31 ex VAT)
CONTACT 020 7365 9820
www.palm.com
PROS Easy to use; long battery life; good software support
CONS Synchronisation software can be tricky to configure; email can quickly fill the device
OVERALL Palm makes some of the best PDAs on the market, and the Vx is the top of the range. It performs a specific job, and consequently is very good at what it does. With a long battery life, this is everything that you need to organise yourself

FEATURES	★★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★★

Ericsson **MC218**

HANDHELD
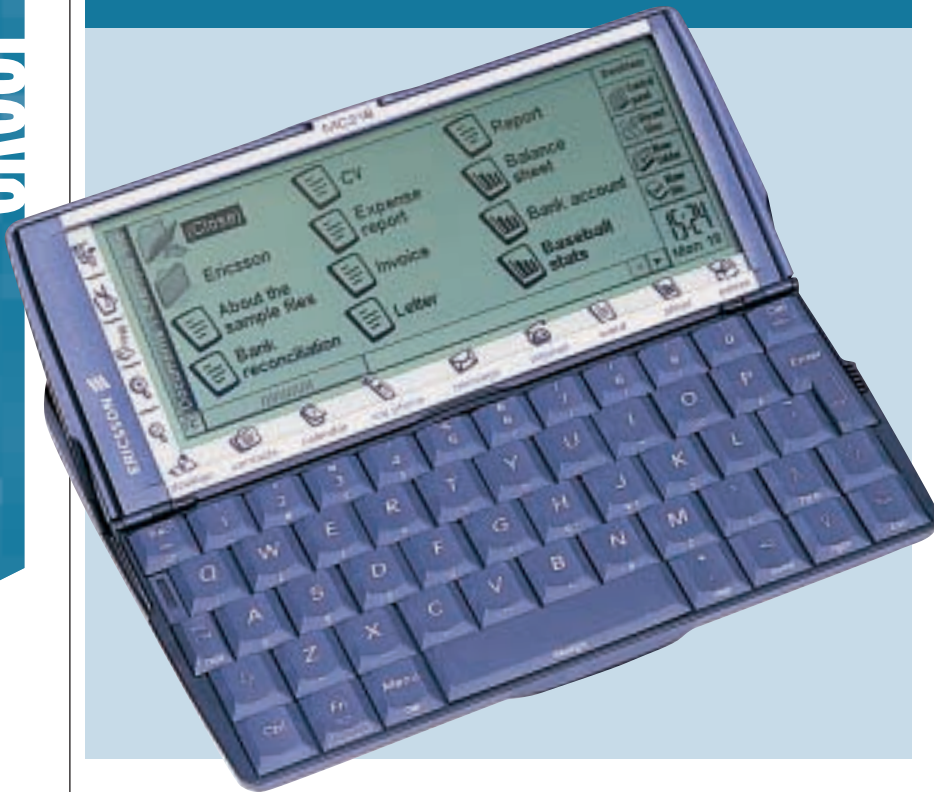
IF YOU THINK YOU'RE seeing double, don't panic – yes, this does look very much like the Psion Series 5mx, and the reason is that the two are actually very close relations.

Psion has had a good run for its money with the Series 5 range, benefiting from a first-class keyboard and a wide, clear screen, but in our last PDA group test it was this Ericsson that denied it first place. This was largely due to the fact that it includes an infra-red modem for use with Ericsson phones and shaves a little off the price.

The basic specs sound fairly mundane when compared to some of the other contenders on test here, but remember that this device is running EPOC, which is far less power-hungry. The MC218 fairly speeds along, then, with a 36MHz ARM 710T processor and 16MB of RAM. Standard built-in applications are burnt into 12MB of ROM, but you'll find a wide range of software available for download or off-the-shelf purchase to supplement these.

If you find yourself approaching the boundaries of the 16MB of RAM or you want a more permanent form of storage, there's a Type I Compact Flash slot to the right, hidden behind a swivel-out flap. The MC218 runs on two AA batteries and is fairly light, although not quite light enough to carry around in a jacket pocket without showing. Although there is a socket for an external power supply, you don't get one in the box.

The monochrome screen is excellent in most lighting conditions, but bear in mind that it only opens to a fixed angle and, like it or lump it, that's how it has to

be used – you can't change it like you can with many of the CE-based devices. A backlight can be switched on and off at will and the screen contrast can be adjusted through 32 levels using the keyboard. Without title bars or permanently displayed menus, the OS and applications work well on the 134 x 50mm half-VGA panel at a resolution of 640 x 240 in 16 levels of grey. Pointer manipulation is by means of a comfortable stylus that slides into a holder in front of the battery compartment, and can directly address any on-screen point on a grid of 695 x 280 locations, which means the pointer is even more accurate than the display.

Ericsson is pretty much a global brand so it's hardly a surprise to see that every key on the keyboard has a second function, allowing you to call up all manner of accented characters and the euro symbol, although strangely this has been located on the 's' key. We were actually a little disappointed by the keyboard on our review device. It was stiff and felt rather cheap, unlike the excellent keyboards found on the Psion equivalents. This feeling of cheapness was carried through in the casing, which is a grainy plastic, and there was a definite scraping as we opened and closed the clamshell body. Hopefully all of these points will sort themselves out as the device loosens up naturally through everyday use. The MC218 also does not look as smart as the Series 5mx, due in large part to the bold keyboard characters and childish on-screen icons. Perhaps to reinforce the importance of mobile communications

to Ericsson's strategy, the icons have also been slightly rearranged so that 'contacts' and 'my telephone' come before the word processor and spreadsheet. The Ericsson does have the upper hand when it comes to storage. While the Psion arrives naked the MC218 wears a smart black case with velcro to hold the device in place.

Three buttons on the front of the casing take care of recording and playing back audio, letting you treat the device much like a dictation machine without having to open it up. Recorded clips can even be saved and used as alarms so you can in effect set yourself up a talking diary.

Bundled with a modem, this is one of the only PDAs on test here that truly meets the needs of the mobile user. It has a problem, though, in that by using its own proprietary file format (translated to PC-understandable data upon synchronisation with a desktop machine) you'll have difficulty getting emailed files understood by their recipients unless they, too, have an Ericsson machine. The ability to save emails as rtf or at least as plain text would have overcome this problem, but that's not an option.

Ericsson is playing up the fact that the MC218 is WAP enabled. This kind of misses the point of WAP, which is really designed for single-box solutions. Using both a phone and a PDA seems a little heavy handed. Unfortunately for Psion there's not yet a plug-in to enable its Series 5mx to do similar.

PC synchronisation is still by means of a standard serial cable. It's a shame this remains the case with so many PDAs when USB is now the ideal interface.

This is the second time we've looked at the MC218 and, this time around we're not as enamoured as we were with the original incarnation. It feels cheaper and less sturdy than the Psion Series 5mx and is not as nice to use. That said, we cannot overlook the fact that Ericsson has bundled an infra-red modem and a case which, while not hard-sided, will protect the device from knocks in a briefcase or travel bag.

NIK RAWLINSON

DETAILS

PRICE £379.99 (£323.40 ex VAT)
CONTACT Ericsson 0990 237 237
www.ericsson.co.uk
PROS A good imitation 5mx; bundled modem and carry case
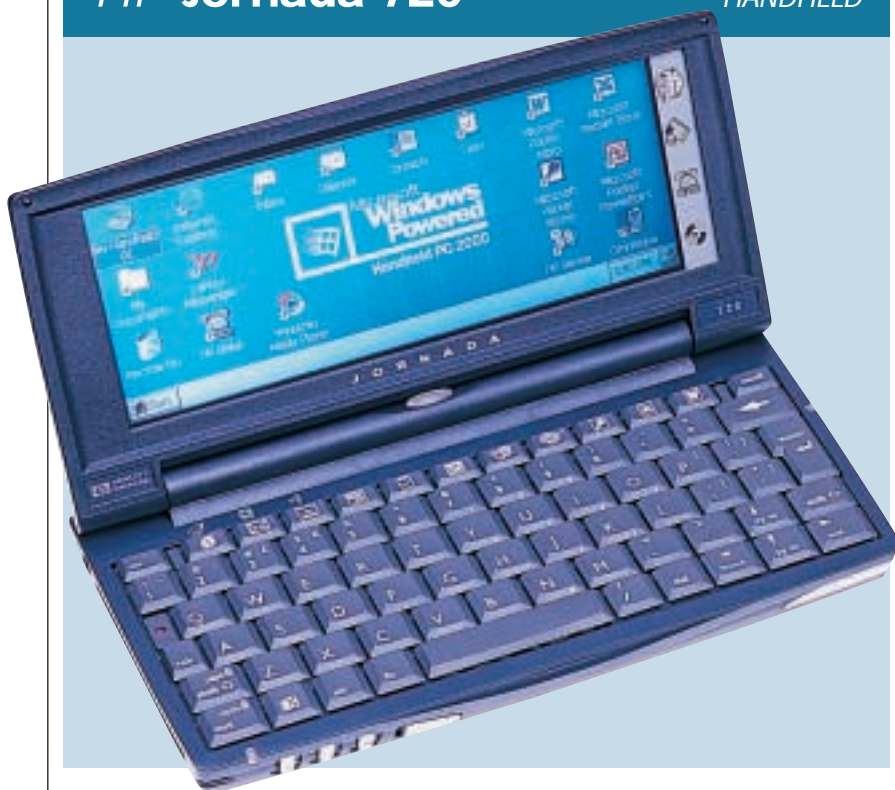**CONS** Build quality of the device is not up to the same standards as Psion
OVERALL Approaching the Psion 5mx, but not quite up there

FEATURES	★★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★★

HP Jornada 720

HANDHELD

HEWLETT-PACKARD'S Jornada 720 is the first PDA to feature Microsoft's Windows for Handheld PC 2000 software. In other words, it's the first clamshell-keyboarded PDA to run the latest version 3.0 of Windows CE. Before you get too excited though, Windows CE 3.0 for Handheld PCs is a very different kettle of fish to the completely revamped version for the latest palm form factor Pocket PCs.

At first glance, the Jornada 720's software appears to be pretty much the same as the earlier 680/690. The Start button's still present and everything needs to be double-clicked. The core pocket application suite of Outlook, Word, Excel, PowerPoint and Access has been updated from 3.0 (on the old 680/690) to 3.01, which as far as we could see, simply involves sporting new-style desktop icons – shame when you consider the significantly redesigned portions of the new Pocket PCs. Microsoft says the new Handheld PC OS is appropriate for the size of the screen on this form factor, and that it's still based on the new Windows CE 3.0 kernel, but 'specialised' for this device.

So what has changed on the software front? Most obviously is the new Pocket Internet Explorer, significantly upgraded and improved from version 3.0 to 4.1. It may not play, say, Flash animations, but it handles web content much better than before (supporting HTML 4.0, JScript, animated gifs, and Java applets using HP ChaiVM). Also new and welcome is the Media Player, which, along with a stereo headphone jack on the side of the 720,

allows you to use the unit as a solid-state personal stereo.

Rather infuriatingly, there's no Pocket ebook reader, as Microsoft has targeted the new HPC OS at 'enterprise rather than consumer' – we'd like to have seen it included anyway. Remaining on the enterprise front, the new OS also includes a Windows Terminal Server client, Microsoft Messaging Queue (MSMQ) and the Crypto API to improve security. HP has also thrown in its own backup and dialup utilities along with a copy of Yahoo! Messenger.

Physically speaking, the 720 looks almost identical to the 680/690. It still measures 189 x 95 x 34mm (w x d x h) and weighs 510g with standard battery. This makes it considerably chunkier than a Psion 5mx, but not so much so that you can't squeeze it into a big pocket. Despite its larger dimensions, the keyboard on the 680/690/720 is not a patch on the Psion 5mx either, but still sufficiently good for banging out plenty of words so long as your fingers aren't too large.

Where the 720 really scores over products like the 5mx, however, is with its 640 x 240 pixel 6.5in colour LCD screen. While HP could have been lazy and kept the same screen as the 680/690, it has increased the colours to proper 16bit, improved the touch-sensitive layer and even fitted a 2D graphics accelerator. The result is a noticeably brighter, clearer screen with faster updates. In addition, with full 640pixel width and 16bit colour, most basic websites are rendered perfectly.

The insides are quicker too: the 133MHz Hitachi SH3 of the 680/690 has

been replaced by a 206MHz StrongARM SA1110 processor, which, coupled with the 720's standard 32MB of memory and improved data bus, increases speed. Applications launch almost instantly, and the websites we visited also opened about 50 per cent faster.

HP has improved the port layout on the 720. There's still separate Type I Compact Flash and Type II PC Card slots, but rather than piggy-backing them as on the 680/690 (which made the bottom bulge), the 720 can swallow them whole while keeping the bottom surface flush. There's no access for cables on the CF slot and it still can't take the IBM Microdrive, but it's a superior arrangement. The backup battery is stored under the CF panel.

Joining the stereo headphone jack is a new Smart Card reader for those corporate customers, and the built-in 56K V.90 modem is still present and correct. We even got online using a Nokia 7110 mobile phone and the IR port without any additional drivers.

Supplied with ActiveSync 3.1 and Outlook 2000, the 720 synchronises beautifully with Windows. Transferring big media files from your PC would take ages over the old serial interface, so HP now includes a USB connection – note that USB is only available from the supplied docking cradle and you have to provide your own cable.

Comparisons are bound to be drawn with the Psion Series 5mx, which is smaller and lighter, features a longer life and boasts the best keyboard of all clamshells. However, the older 680/690 was immediately preferable in many cases with a colour screen and built-in 56K modem as standard.

While the 720 doesn't share the OS quantum leap of its Pocket PC conterparts, HP and Microsoft have made several significant enhancements over the 680/690. It's quicker, the battery lasts up to nine hours, there's a Smart Card reader, Media Player and the best web browser in this form factor.

GORDON LAING

DETATILS

PRICE £665 (£565.96 ex VAT)
CONTACT 0990 47 47 47
www.hp.com/jornada
PROS Colour screen; built-in modem; media player; loads of ports
CONS Software not massively different from the old 680/690
OVERALL With seriously improved performance, all the ports you can handle, the best PDA web browser and personal stereo capability, the Jornada 720 will be the perfect handheld for many users

FEATURES	★★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Psion **Revo Plus**

PSION HAS LONG BEEN the innovator in the handheld PC market, with both its hardware and software garnering praise for being well-designed and easy to use. When the Revo was launched 12 months ago though, eyebrows were raised. Given Psion's dwindling share of the handheld market, a slimmed-down Series 5mx (both in form and function) hardly seemed a wise idea. Despite being truly pocket-sized, the lack of a backlit screen, modem and expansion slot made the Revo look decidedly lacklustre.

It's been a busy year since then – Palm came up with the colour IIIc and Microsoft finally figured out palmtops with the Pocket PC. Psion hasn't been idle either and in September, the Revo Plus arrived.

If you were expecting the Revo Plus to be the next generation of Psion handheld, reaping the rewards of its Symbian partnership, you're in for a big disappointment. The Revo Plus is merely an upgraded Revo and that upgrade goes no further than doubling the RAM to 16MB. There are other new features but these lie solely in the new bundled software. Before we get to that, let's recap on the Revo's main points.

Despite its shortcomings, the Revo Plus (and the more able Series 5mx) is still one of the most capable keyboard-based pocket computers. The main reason for this is its elegant EPOC32 operating system and a suite of well-crafted applications. EPOC32 runs well on relatively low-specification hardware, which is why while Pocket PCs have 200MHz RISC processors, the Revo Plus

manages with a 36MHz ARM 710T and feels none the slower for it.

Given its handheld heritage, it's no surprise that Psion knows what it's doing when it comes to writing usable applications and those on the Revo Plus are largely the same as those found on the Psion Series 5mx and Series 7. The word processor, spreadsheet, contacts database and agenda make good use of the small screen and if you have a suitable infra-red mobile phone, the email and SMS client let you communicate on the move. Another point in the Revo Plus' favour is the well-established EPOC32 developer base.

Although the Revo included a web browser as part of its application suite, it wasn't great. It occupied a big chunk of the Revo's RAM and had no support for secure sites. Installing Java support ate up yet more memory but the browser still fell over accessing sites that a Windows CE device would eat for breakfast. This time round, Psion has opted for Opera 3.62 as the browser and it occupies just 2MB of RAM.

Opera supports 128bit SSL (secure socket layer) 2 and 3 encryption, TLS (transport layer security) 1.0 for secure online transactions and embedded Java applets. So in theory at least, you can use your Revo Plus for safe ecommerce, providing you have access to a telephone connection. In practice, Opera works well but it's sufficiently different from Internet Explorer and Netscape to confuse users the first time they use it. Despite being superior to the EPOC browser, Opera still lags well behind Pocket Internet Explorer and the Revo

Plus' small, murky screen, limited multimedia support and ponderous displaying of complex web pages make for a frustrating Internet experience.

The Revo Plus also includes a WAP (wireless application protocol) browser, the idea being that it makes more sense to update your handheld software rather than your phone to keep up with mobile browsing. Given the limitations of the Revo Plus and WAP itself, this works well enough but using two devices to perform a task designed for one seems to miss the point a little. After all, the beauty (if that's the right word) of WAP is that you can discretely use your phone while walking along to find out what's on at the cinema. With the Revo Plus, you have to find somewhere to put both it and your phone while you tap at a keyboard.

While Palm, Handspring and Windows CE devices are able to communicate smoothly and quickly with PCs via USB connections, the Revo Plus is still lumbered with PsiWin and a comparatively slow serial connection. When it works, PsiWin does well enough and will synchronise data between the major Windows office applications with relative ease. The problem is getting PsiWin to work at all and it seems unable to detect a connected Revo Plus more than 25 per cent of the time.

Even with a connection established, PsiWin is often unable to show the contents of 'My Psion'. If you remove your Revo Plus from the docking cradle and then replace it, a reboot of the PC is usually needed before a connection can be re-established. It's baffling that Psion hasn't been able to fix this problem with version 2.3 of PsiWin and why it's still relying on a serial connection is anyone's guess. Version 2.4 of PsiWin and USB support is due soon but whether it improves the Revo Plus' poor PC connectivity remains to be seen.

JULIAN PROKAZA

DETAILS

PRICE £299.95 (£255.28 ex VAT)
CONTACT Psion 0990 143 050
www.psion.co.uk
PROS Compact design with usable keyboard; powerful; easy-to-use application suite; long battery life
CONS Small, non-backlit monochrome screen; requires extra hardware for Internet access; hit-and-miss PC connectivity
OVERALL The Revo Plus is a versatile performer and a good choice for anyone looking for a compact keyboard-based handheld, but despite the added RAM and extra software it's starting to look like yesterday's technology

FEATURES	★★★★
EASE OF USE	★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★

Psion Series 5mx

HANDHELD

THE PSION SERIES 5MX is a quality piece of kit. From the moment you open the box and find the unit nestled neatly in the packaging, it exudes quality. Getting going is a simple process of putting in the supplied batteries and powering up the unit. Then you're off to new heights of handheld computing.

The unit itself is bigger than Palm's PDAs, but then you get a keyboard and a bigger screen for this trade-off. The dimensions allow it to fit into a jacket pocket, although its weight (354g) will mean your suits just won't sit right. Despite this, it is a convenient size for easy transportation and feels robust and well constructed.

Opening up the screen highlights the unit's design quality. The keyboard slides out as the clamshell is opened. The stylus is located on the side and is accessed by pressing it in and allowing it to spring out. As the unit is longer than the Palm units, the stylus is a good size and feels more comfortable to use as a result.

The screen has a resolution of 640 x 240 and the characters can be increased in size if you are struggling to see them. As the panel has a backlight, viewing is not a problem – even at the smallest character size. Below the screen are small pictures that give access to the main programs directly through a touch of the stylus. To the left are buttons to activate dropdown menus, a cut command button, infra-red activation, and the character size zoom control.

To get to the main system screen, a clearly marked orange button is situated on the bottom left corner. Here, the usual options are available: control panel, recently used files, new file, etc. It is similar enough to standard Windows operating systems for you to manage to navigate your way around easily. From the control panel various things can be set up, such as screen contrast, time, and there is an add/remove programs button to allow you to keep track of the installed programs. Use of the dropdown menu also allows memory usage and battery life to be monitored.

Applications for the 5mx include the usual organisers, jotters and calculator one would expect from a handheld device. Where the Psion comes into its own, though, is in the inclusion of Word and a spreadsheet package. These are fully working applications, albeit not quite as versatile as their PC-based counterparts. Inclusion of Word allows proper documents to be drafted up for printing or emailing when connected to the PC. The 5mx even has a spell checker as standard to ensure what you are producing is of good quality.

The keyboard is about two-thirds the size of a conventional computer keyboard and typing is no problem at all. The keys have a satisfying feel when pressed, although if you are not pressing the button down directly it tends to not register the keystroke. Overall, though, the keyboard makes this an ideal mobile word processor, and with printing through your PC an automatic operation, you don't even need to upload your documents for output.

Connection of the Psion to your PC is a simple operation. The supplied serial cable plugs into an available nine-pin serial port (no 25pin adaptor is supplied) and the other end connects into the Psion beneath a protective cover on the rear. The software disc has various applications and programs that you can install (and Psion has left precisely which ones up to you, so you don't clog up the available resources). With the link and software installed, you can transfer data between your PC and the Psion, as well as print and email. If you have a laptop there is an infra-red port in the back of 5mx, so transfer of information this way is an option.

As with most other PDAs, upgrade options are available and with the 5mx's screen being larger than most (and with a higher resolution) you can even get hold of some passable games. For those who travel frequently, there is a Berlitz interpreter and a phrase book, turning the 5mx into a useful travel tool.

As for hardware, a cable is available to connect directly to a printer, allowing you to print off documents. There is also a PC Card modem adaptor for the Psion Gold Card range of modems. Solid-state Flash memory cards for storage can be purchased from Psion and any other Compact Flash memory manufacturer.

Psion has supplied an extremely comprehensive manual with the 5mx. So if you are a first-time user of any kind of computer at all, you can quickly get up to speed – although it is unlikely that anyone with PC experience will do more than give it a cursory glance.

Overall, the Psion Series 5mx is an excellent handheld that is easy to both use and transport. With 16MB of RAM and 15MB of Flash disk space it has room for all that most users can throw at it – and it has a Flash slot for the addition of another Flash disk or any other upgrades. It even has OPL (Organiser Programming Language) for those who want to try their hand at a bit of programming. It isn't cheap at £399.95 inc VAT, but if it's a computer you need rather than a computerised notepad, this is an ideal solution.

SCOTT MONTGOMERY

DETELS

PRICE £399.95 (£340.38 ex VAT)
CONTACT Psion 0990 143 050
www.psion.co.uk
PROS Efficient word processor and usable-sized keyboard
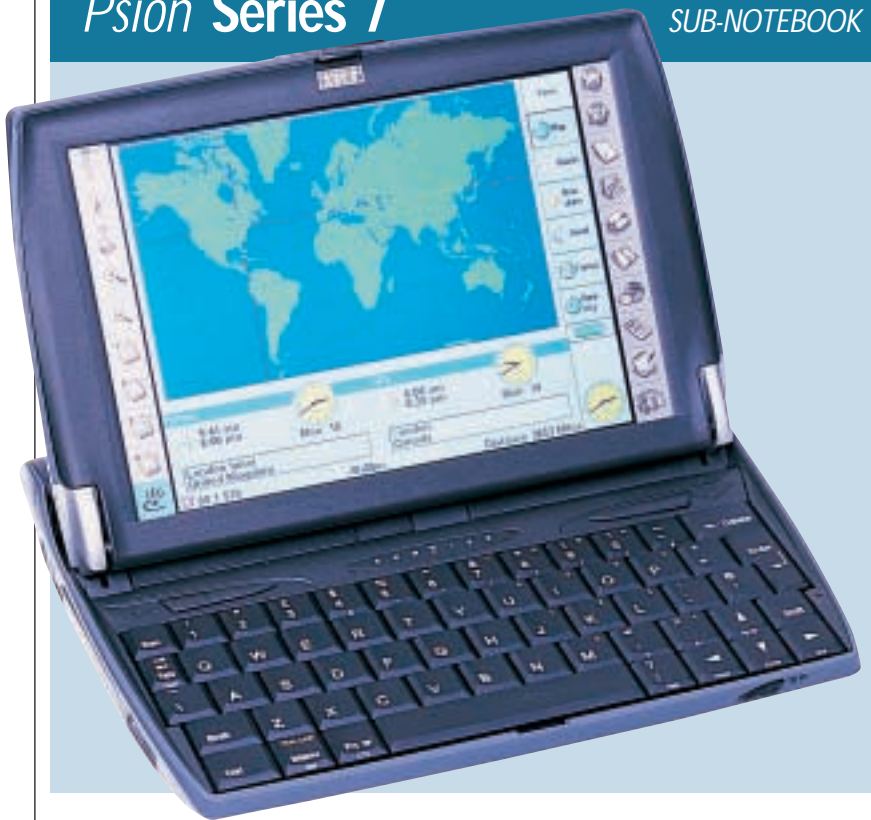**CONS** A bit heavy for putting into a pocket
OVERALL It may be a little expensive, but if it's a small computer you're after rather than just an electronic organiser, this is a good-quality, functional solution

FEATURES	★★★★★
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★★

Psion Series 7

THERE CAN BE FEW people in the PDA-using world who aren't aware of Psion's reputation for excellence in design. The Series 7 takes that reputation and boosts it beyond the clouds and far out into the stratosphere.

Such is the unusual nature of this PDA/notebook hybrid that it genuinely does turn heads. This is mainly thanks to its unique navy-blue leather casing. In a nutshell, the Series 7 is a grown-up Series 5 equipped with a colour screen, bigger keyboard and a long-life rechargeable battery.

Although it's little more than a year since the Series 7 hit the streets, it has quite a history. It really began life as the netBook – a slightly beefier version of what we now know, but aimed at the corporate user and bought in bulk. Naturally, when word got out, Joe Public was keen to get his hands on the mythical colour Psion and ultimately the company performed a *volte face*, trimming a few of the specifications and launching it as the Series 7.

Enough of the history lesson – just how good are the goods? There's no denying that it's a desirable piece of kit, particularly to anyone who needs to word process or perform other basic office tasks on the move. The sheer joy of getting away with carrying something barely the size of a hardback novel in place of a notebook PC and getting over eight hours of battery life is truly liberating. Even the lightest notebooks are still just too big for comfort.

The software you'll find in place is, of course, the usual spread of EPOC goodies from Word through Sheet, Agenda, Contacts and Spell to the newer email application and web browser. The addition of colour is certainly helpful when using the spreadsheet for graphing, doodling a sketch or browsing the Internet, although it doesn't add much to the word-processing experience. Speaking of appearances, the touch-sensitive 7.7in screen can manage a resolution of 640 x 480 pixels and is clear in all but the very brightest of conditions.

The larger form factor naturally accommodates a bigger keyboard – in this case, it's not too far off full size. Typing is actually almost as comfortable as on a regular keyboard, although Psion has switched the location of the 'Menu' and 'Fn' keys, which can be annoying at first, particularly if you're accustomed to a Series 5. The hinge is a variation on Psion's usual clamshell design, with the base of the screen sliding forward the further you open the case. This increases stability and prevents the whole shebang from falling over when you tap on the screen. Needless to say, it all slides in and out as smooth as silk. The stylus is also one of the better examples we have seen in this group test. It's well balanced and in the hand it actually feels like a pen.

The beating heart of the Series 7 is a 133MHz StrongARM processor operating in tandem with 16MB of DRAM. The EPOC OS resides in ROM, which is where it has one over on its big brother, the netBook. Memory expansion is possible through the addition of a proprietary plug-in 16MB DIMM should you need it.

As for ports, there are two that should be scrutinised closely before making your mind up. The first is a Compact Flash II tray, into which you can pop any suitable card you fancy, as long as it doesn't have any protruding parts, such as the cable from a modem. This, for once, is a piece of rank bad design – all Psion had to do was leave it as a regular slot, rather than making it into a tray. In addition, the Type II PC Card slot is something of a letdown. It's a great idea in theory, but since it can handle only a Psion Dacom modem card, it's of little more use to you than a chocolate teapot.

While we're looking at the failings of the unit, one of the biggest areas of concern is that of email and online functionality in general. In hardware terms, it's massively disappointing not to see a built-in modem. These days Psion is up against some stiff competition in the form of a slew of fully featured Pocket PCs and really needs to pull its finger out on the connectivity front. The latest product launch – the Revo Plus – is a perfect example of this blinkered thinking. Unless you have a phone with an infra-red modem, you'll need to buy either a Psion infra-red travel modem or the aforementioned PC Card modem.

As far as the Internet software goes, it's all as you'd expect, apart from a few small problems with the browser not supporting JavaScript. This should be rectified with the release of a new JS-enabled Opera browser. The major problem is compatibility – if you write an EPOC Word document on the Series 7 and email it to someone else, all you'll get back from them are complaints that they can't open it, which is little short of pointless. It's possible to read Microsoft Word documents received by email, but that's only half a solution.

The bottom line remains that the Series 7 is a great laptop replacement and well worth checking out, provided you can live with its limitations.

J MARK LYTLE

DETAILS

PRICE £699.95 (£595.70 ex VAT)
CONTACT Psion 0990 143 050
www.psion.com
PROS Lightweight alternative to even the slimmest notebook PC; long battery life
CONS No internal modem; no onboard file converter
OVERALL The Series 7 is almost perfect for anyone who needs to work on the go. Its flaws, such as the inability to email universally readable documents, could be a serious problem

FEATURES	★★★★
EASE OF USE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Samsung **IZZI-Pro Swivel** *SUB-NOTEBOOK*
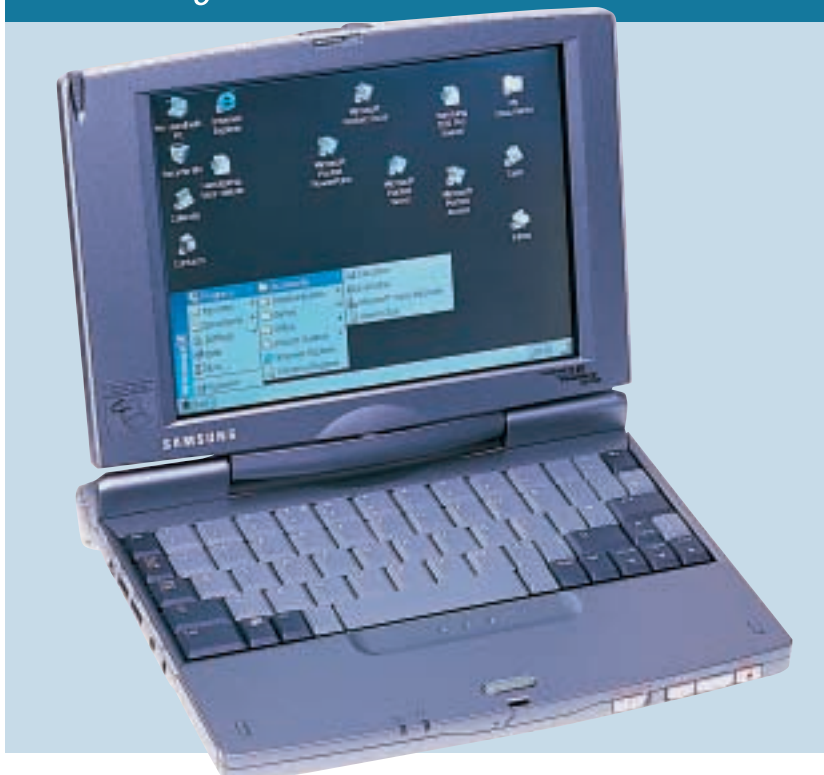
SAMSUNG SEEMS TO BE going IZZI crazy, using the name to brand many of its forthcoming products. The Pro Swivel flavour, though, relates to its sub-notebook sized Windows CE device, which has one unique selling point – a rotating screen, hence the 'Swivel'. More about that in a moment.

Stripped to the basics, the core of this machine is a 129MHz Toshiba processor. This 32bit RISC chip is supplemented by 32MB of EDO DRAM, which puts it up there with the big players, and on par with some of the less powerful desktop PCs. This gives it plenty of space to put the internal microphone to good use, and it'll store up to 60 minutes of voice recordings when set to capture 8bit mono. This generous 32MB is backed up by a further 16MB of ROM for application storage, so this really is one of the most capacious PDAs on offer.

Unfortunately, the Swivel arrived on the scene just a little too early to take advantage of the version of Pocket PC released for use on keyboarded devices, and so retains Windows CE 2.11, which feels very natural on a device of this size and works far better than those CE implementations running on smaller devices.

Samsung has added its own IZZI Pro applet to the Control Panel. This sets the modem country code, letting you choose from a range of nine territories, of which five, namely France, Germany, Norway, the Netherlands and the UK, will be of use to European travellers. It also toggles CRT use on and off and graphically displays the remaining level of battery power, which is far more informative than the standard Good/Low status facilities of standard Windows CE distributions. Finally, it lets you set your own brightness and contrast and specify how many steps the backlight should fade through when the device is not used for a specified length of time.

It tips the scales at 1Kg and is around the size of a small hardback book at 228 x 196 x 25mm (w x d x h), so it'll easily fit into a briefcase or onto the seat-back tray of a plane or train. Unfortunately, though, the keyboard inhabits a strange nether-world somewhere between a full-sized notebook and a traditional PDA and we often found ourselves mis-keying when typing at speed. No doubt this problem would be overcome in time but it was an irritating introduction. There is one plus point to this keyboard, in that it incorporates a euro symbol, accessible using Ctrl-Shift-5, which sets it apart from many of its competitors.

The screen is an 8.2in DTSN VGA touch-sensitive panel capable of displaying 256 colours at a top resolution of 640 x 480. As mentioned, this swivels and if you fold it flat a magnet on the back will hold it in place, so you can use it in either tablet or traditional notebook modes. As there is no glidepad or trackpoint for moving the pointer you're committed to using the supplied stylus, so we were pleased to see that the panel's hinge was sufficient to prevent our prodding from jogging the screen when in use. Unfortunately, though, whatever Samsung has used to cover it is prone to reflecting every light in the room, which is a major distraction if you intend to use the device for extended periods.

We were disappointed that the Swivel doesn't seem to switch itself off when you close the lid. As this is pretty standard fare for other CE devices we often found ourselves leaving it on when we weren't using it. Fortunately, it benefits from a battery life of eight hours (according to Samsung) and has an average recharge time of three and a half hours.

A quick tour around the edges reveals enough ports and sockets to put even a fully featured notebook to shame. To the right there's a PC Card slot, reset point, power socket and internal modem, while to the left a proprietary VGA port for an external monitor, the PC connection interface, headphone and microphone sockets and a Type II Compact Flash slot. It's a shame Samsung opted for a non-standard VGA interface when some other manufacturers managed to squeeze in a widely accepted D-SUB as it means you can only use the Samsung-supplied cable if you want to connect to a monitor. Finally, at the back of the device sit the USB and IrDA 2.0 ports. It's a widely recognised fact that there is little in the way of CE-compliant USB devices but it's nice to have the port there just in case any should come along in the future.

In all, the IZZI-Pro Swivel is a nice attempt at a sub-notebook sized device but it's let down by its screen. The ability to turn it into a tablet is really little more than a gimmick, but if Samsung could come up with genuinely useful tablet-oriented software it might be able to corner a unique market. As it stands, there is little to make the tablet form factor a must-buy feature, apart from the fact you'll probably be the only person you know who has one. That said, in this larger form factor arena there's little to choose from, so if you need one it's still worthy of consideration.

NIK RAWLINSON

DETAILS

PRICE £938.83 (£799 ex VAT)
CONTACT Samsung 0800 521 652
www.samsungelectronics.co.uk
PROS Euro symbol; plenty of memory; lots of ports; long battery life
CONS Non-standard VGA port and disappointing screen are both drawbacks; doesn't switch itself off automatically when the lid is closed; fairly pricey
OVERALL Difficult to recommend with this screen, especially when you consider the cost of the machine

FEATURES	★★★★
EASE OF USE	★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Table of features: palmtops

MANUFACTURER	CASIO	COMPAQ	COMPAQ	HANDSPRING
MODEL	CASSIOPEIA E-115	AERO 1550	iPAQ H3630	VISOR DELUXE
Price inc VAT (ex VAT)	£499 (£424.68)	£269.08 (£229)	£448.85 (£382)	£199 (£169.36)
Telephone	020 8450 9131	0845 270 4000	0845 270 4000	020 7309 0134
FEATURES				
CPU (speed)	MIPS VR-4121 (131MHz)	MIPS R-4111 (70MHz)	Intel StrongARM RISC (206MHz)	Motorola Dragonball (16.6MHz)
RAM/ROM	32MB/16MB	16MB/16MB	32MB/16MB	8MB/2MB
Size (h x w x d in mm)	131.2 x 82.5 x 20	130 x 79 x 12.7	130 x 83.5 x 15.9	121.9 x 76.2 x 17.8
Weight	255g	150g	190g	180g
Operating system	Pocket PC	Pocket PC	Pocket PC	Palm OS 3.1
Input method	Stylus	Stylus	Stylus	Stylus
Voice recorder/modem	✔/✘	✔/✘	✔/✘	✘/✘
Display type	TFT	STN	TFT	Backlit LCD
Display resolution	240 x 320	240 x 320	240 x 320	160 x 160
Colour/monochrome	Colour	Monochrome	Colour	Monochrome
Infra-red	IrDA	IrDA	IrDA	✔proprietary
Compact Flash slot	✔	✔	✘ (optional)	✘
PC Card slot	✘	✘	✘ (optional)	✘
Serial	✔	✔	✘ (serial version available)	✘
USB	✘	✘	✔	✔
Other	Serial cradle, AC adaptor, soft case	Serial cradle, AC adaptor, leather case	USB cradle, ambient light sensor, alarm LED	USB cradle, leather case, plastic cover
BATTERY				
Quoted battery life	6hrs	14hrs	10hrs	Up to 1 month
Battery type	Li-ion	Li-ion	Lithium-polymer	2 x AAA alkaline

Table of features: handhelds & laptop replacements

MANUFACTURER	ERICSSON	HP	PSION	PSION	PSION	SAMSUNG
MODEL	MC218	JORNADA 720	REVO PLUS	SERIES 5MX	SERIES 7	IZZI-PRO SWIVEL
Price inc VAT (ex VAT)	£379.99 (£323.40)	£665 (£565.96)	£299.95 (£255.28)	£399.95 (£340.38)	£699.95 (£595.70)	£938.83 (£799)
Telephone	0990 237 237	0870 547 47 47	0990 143 050	0990 143 050	0990 143 050	0800 521 652
FEATURES						
CPU (speed)	ARM 710T Risc (36MHz)	Intel StrongARM SA1110 (206MHz)	ARM 710T Risc (36MHz)	ARM 710T Risc (36MHz)	StrongARM SA1100 (133MHz)	Toshiba MIPS TX3922 (129MHz)
RAM/ROM	16MB/12MB	32MB/16MB	16MB/8MB	16MB/10MB	16MB/12MB	32MB/16MB
Size (h x w x d in mm)	24 x 172 x 90	34 x 189 x 95	18 x 157 x 79	23 x 170 x 90	37 x 235 x 182	25 x 228 x 196
Weight inc batteries	350g	510g	200g	354g	1.15Kg	1.15Kg
Operating system	EPOC	Win HPC 2000 (WinCE 3.0 core)	EPOC	EPOC	EPOC	Win CE 2.11
Input method	Keyboard and stylus	Keyboard and stylus	Keyboard and stylus	Keyboard and stylus	Keyboard and stylus	Keyboard and stylus
Voice recorder/modem	✔/*	✔/V.90 (RJ11port)	✘/✘	✔/✘	✔/✘	✔/V.90 (RJ11 port)
Display type	Backlit LCD	LCD	LCD	Backlit LCD	Backlit STN LCD	8.2in VGA DSTN LCD
Display resolution	640 x 240	640 x 240	480 x 160	640 x 240	640 x 480	640 x 480
Colour/monochrome	Monochrome	Colour	Monochrome	Monochrome	Colour	Colour
Infra-red	IrDA	IrDA	IrDA	IrDA	IrDA	IrDA
Compact Flash slot/PC Card slot	✔/✘	✔/✔	✘/✘	✔/✘	✔/✔	✔/✔
Serial/USB	✔/✘	✘/✔	✔/✘	✔/✘	✔/✘	✔/✔
Other	WAP enabled, soft case	USB cradle, Smart Card reader slot	AC adaptor, serial cradle	Serial lead	Docking station interface	VGA port, RJ11 to BT cable, serial & VGA cables
BATTERY						
Quoted battery life	1 month	Up to 9hrs	14hrs	1 month	8.5hrs	8-10hrs for AA pack
Battery type	2 x AA alkaline	Li-ion	NiMH	2 x AA alkaline	Li-ion	Li-ion/6 x AA alkaline

KEY: * = IrDA modem for compatible Ericsson phones included

	HP	PALM	PALM	PALM	PALM
	JORNADA 548	**PALM M100**	**PALM IIIC**	**PALM IIIE**	**PALM VX**
	£439 (£373.62)	£130 (£110.64)	£320 (£272.34)	£149.99 (£127.65)	£299.99 (£255.31)
	0870 547 47 47	020 7365 9820	020 7365 9820	020 7365 9820	020 7365 9820
	Hitachi SH3 (133MHz)	Motorola Dragonball (16.6MHz)	Motorola Dragonball (20MHz)	Motorola Dragonball (16.6MHz)	Motorola Dragonball (20MHz)
	32MB/16MB	2MB/2MB	8MB/2MB	2MB/2MB	8MB/2MB
	130 x 78 x 16	118 x 79 x 18	127 x 79 x 17	119.8 x 81 x 17.7	115 x 80 x 10
	260g	140g	192g	170g	120g
	Pocket PC	Palm OS 3.5	Palm OS 3.5	Palm OS 3.1	Palm OS 3.5
	Stylus	Stylus	Stylus	Stylus	Stylus
	✔/✗	✗/✗	✗/✗	✗/✗	✗/✗
	Backlit CSTN	Backlit LCD	Backlit TFT	Backlit LCD	Backlit LCD
	240 x 320	160 x 160	160 x 160	160 x 160	160 x 160
	Colour	Monochrome	Colour	Monochrome	Monochrome
	IrDA	✔ prioprietary	✔ proprietary	✔ proprietary	✔ proprietary
	✔	✗	✗	✗	✗
	✗	✗	✗	✗	✗
	✔	✔	✔	✔	✔
	✔	✗	✗	✗	✗
	USB cradle, AC adaptor	Flip cover	Serial cradle, flip cover AC adaptor and plugs	Serial cradle, flip cover, serial converter	Serial cradle, leather cover, serial converter, AC adaptor
	8hrs	Up to 2 months	Up to 2 weeks	Up to 2 months	Up to 1 month
	Li-ion	2 x AAA alkaline	Li-ion	2 x AAA alkaline	Li-ion

Thanks for the memory...

Where memory is concerned, handheld devices are somewhat limited in comparison to full-size laptops. The biggest issue is power consumption, since battery life is everything on a handheld. There are a few different storage media that have become the de facto standard by now. Perhaps the best known is Compact Flash or CF cards, closely resembling a half-sized version of the PC Card that you find in a laptop. The main difference is that CF cards drain less power than PC Cards and, of course, they use less space.

There are two flavours of CF card, Type I and Type II. Type II cards are thicker and so are incompatible with Type I slots. The cards come in a variety of capacities from about 8MB to 192MB and we should soon see even bigger cards than this.

IBM also has its now famous Microdrive in Type II format, which is available in sizes up to 1GB. Other popular Compact Flash cards are network cards and modems.

A less popular storage media for handhelds is Smart Media. These are smaller and thinner than Compact Flash.

They are limited to memory use only, and range from 4MB to 64MB in size. Smart Media is more commonly found in digital cameras than PDAs.

A third media type quickly gaining acceptance among MP3 players is MMC or Multimedia Cards. MMCs are smaller than Compact Flash and like

Smartmedia are also only available for memory storage. A few up-and-coming Springboard modules that will soon be available for the HandspringVisor will also support the MMC cards.

And finally there is the Sony Memory Stick, which seems to be increasing in popularity even though it has so far only been available in devices from Sony. Also a storage-only technology, it is similar to Smart Media and MMC but again comes in a different size. The only PDA that is compatible to date is Sony's Clié range, currently only available in Japan and the US.

With the growing number of devices that use or require some form of compact removable storage, the market for these modules seems to be healthy. It is, however, fragmented between the competing formats mentioned above, which raises the question of standardisation. Will one technology become as universal as the humble floppy disk? None of manufacturers want to give up any ground to the competition so this will take a long time – especially when the big players have to be serious about standardising.

LARS-GORAN NILSSON

Editor's **Choice**

The term Personal Digital Assistant generally defines a gadget serving as a personal organiser for contacts, notes and to do lists, but that term has lately broadened to encompass devices for movie watching, audio playback and Internet browsing. Add to this the fact that we all have different usage requirements and it becomes clear that selecting the best is a tricky decision.

With such a diverse range of options and form factors we split the various contenders into three: palmtops, handhelds and laptop replacements. In each of the categories we weighed up the pros and cons for each device and then assessed their features, ease of use and value for money.

The winners

The Palmtop category saw a closely fought battle between two devices, one running Pocket PC and the other Palm OS. We debated the virtues of each operating system but could not judge one device to be better than the other on the basis of OS alone. We therefore gave two **Highly Commended** awards, one to the Palm OS-driven **Handspring Visor Deluxe** and the other to the **HP Jornada 548** running Microsoft's Pocket PC.

If you want an all-round multimedia device with a colour screen, stereo sound and movie playback the Jornada 548 has the capability. In addition, it has a built-in Type I Compact Flash slot, giving expansion potential. You can argue that the Casio has built-in expansion potential too and that the Compaq iPAQ runs faster, but the Jornada 548 is £60 cheaper than the Casio, and the iPAQ only offers expansion through its optional jacket system. As for the Handspring Visor Deluxe, the Springboard slot has a lot going for it, promising to expand the functionality of the device. At £199 the 8MB Visor is keenly priced, and comes with a multi-functional stylus and USB cradle.

Moving to the handhelds, we again find two award winners with differing operating systems. The Psion Series 5mx runs EPOC, while HP's Jornada 720 is driven by Microsoft's handheld version of WinCE 3.0.

Again, each OS had its fair share of fans, so ultimately it came down to other features. First up, the **Psion Series 5mx**. This lovely unit looks the part and has a keyboard that's a pleasure to use. While the 5mx and the Ericsson MC218 are almost identical, Psion gets the **Editor's Choice** for its superior overall build quality. Nevertheless, Ericsson came close by bundling an infra-red modem.

If EPOC just isn't your thing you could opt for the **Highly Commended HP Jornada 720**. At £665, it is not the cheapest but you get a range of features. With Microsoft's HPC OS, the new Pocket Internet Explorer allows you to view content through the 720's internal modem. In addition Compact Flash Type I and Type II slots are included and performance is boosted by a 206MHz processor. We were also impressed by the 720's clear colour screen and the inclusion of a Smart Card reader.

Finally, the **Psion Series 7** earned itself a **Highly Commended** accolade, winning the duel between laptop replacements. The Samsung is an interesting device, but it wasn't on a par with the well-built Series 7. It does have a notebook-like array of ports, but for just a little more money you could buy a real laptop. The Series 7, on the other hand, is a genuine lightweight alternative to a notebook with a colour screen and keyboard that are a joy to use. The lack of a modem is disappointing and the problem of file compatibility may put some users off, but this aside the Series 7 is a good choice for users on the go.

The Visor promises expandable functionality

HP's Jornada 548 is ideal for multimedia

The Psion 5mx is stylish and versatile

HP's Jornada 720 has a host of features

Psion's Series 7 takes the place of a laptop

Get into

Do you want to make dance music but know little about the mechanics of music creation? Today's modern music software can give you the opportunity to become the next Judge Jules. Ian Waugh tests the software that gets you moving

T

Technology is a wonderful thing. Word processors have made us all typists, graphics software has turned us into designers, the web has given everyone the opportunity to become an entrepreneur and spreadsheets have turned us all into accountants (well, maybe there are drawbacks after all). And now there is software that can make us all into musicians.

But it's not any old music, it's dance music. Although dance has its roots in many types of popular music, from soul and reggae to funk and R&B, much of it is a product of computer technology, so using a computer to 'compose' it seems fitting.

There are over 100 types of dance music, although if the arms of the music journalists could be twisted far enough the genre could possibly be squeezed into a handful of broad categories, such as house, techno, drum & bass, breakbeat and ambient for those chill-out moments. Virtually all dance music involves processing sampled sounds and linking sampled drum and bass loops into interesting rhythmic and melodic combinations.

So how can a computer help the non-musician produce dance music? Simple – the software supplies hundreds, even thousands, of pre-recorded drum, bass and melody sample loops and all the user has to do is put them together in interesting combinations. The software matches the tempo and key. The process has been likened to painting by numbers, but the results are often surprisingly professional.

The 16 programs we've looked at can be broadly divided into re-mixing software and sample-sequencing software. Some of the programs cover both categories while others have facilities for creating your own drum and melody lines, so you don't have to follow the 'colour scheme' if you don't want to. There are also two programs that specialise in manipulating the core of all dance music – the drum loop.

As these programs will mainly be of interest to non-professionals, we've restricted coverage to affordable software and concentrated on ease-of-use and quality of results.

the mix

contents

• *Sample sequencers reviewed by Ian Waugh*

Aludra **Beat 2000**

BEAT 2000 HAS been around for three years but it still boasts more features than many of the other programs in this group test. If you do a dollar-to-pound conversion it's cheaper, too.

It's essentially a remixer with limited sequencing facilities. Operation is very simple. The main Beat 2000 screen contains 20 tracks or sample slots into which wave files are loaded. The samples are played by clicking on them or by pressing keys on the PC keyboard. Each track has volume and pan controls.

If you record a mix in real time and then select the Pro 2000 screen, you will see 20 tracks, one for each of the samples, and it shows where each one enters and leaves the mix in waveform format. You can adjust the start and end positions of these by clicking and dragging and you can paint in new entries. You can't zoom in, though, for accurate work and the entries don't snap to a bar or beat division.

The Drumatik editor is a separate program and appears in a separate window. It offers a standard drum grid with 20 selectable samples down the left and the grid can be set to one, two or four bars. However, the grid doesn't change; it only limits where the hits can

be inserted. There are only eight divisions per bar, although there is an option to use two bars of one-sixteenth notes, which is better but not ideal. Drum patterns must be saved as wave files and then loaded into the main program so there may be scope for creative editing.

Which brings us to Audiomatik, a separate audio editor program. It's well specified with zoom controls, trim options and a batch converter. It also includes several effects such as echo, chorus, reverse, compress, volume adjustment, fades and pan. The controls aren't very sophisticated, but they do the job.

Beat 2000 strikes an uneasy balance between remixing, sequencing and audio editing. The sequencing is not flexible enough to warrant buying just for that purpose. The ideal user is someone who wants to do remixes (20 tracks are available), use Audiomatik to edit and create wave files and who is happy to edit mixes in the sequencer.

DETAILS
★★★

PRICE $39.95 (approx £25) (order online)
CONTACT Aludra 001 416 638 6989
www.aludra.com
SYSTEM REQUIREMENTS Pentium 60 (100 recommended), Windows 95, 16MB of RAM (32MB rec), 2x CD-ROM drive (4x rec), DirectX-supported sound card
PROS 20 tracks (good for a remixer) and an audio editor
CONS Programs not integrated; limited drum editor and few samples
OVERALL A very usable program but overshadowed by competitors' updates

Best Service **Media DJ**

LOOK AT THE price and you'll probably be wondering what the catch is. Well, the program is a few years old and it's essentially an enhanced version of another Best Service program written with Macromedia Director called Circle Elements. Operation, it must be said, is far from intuitive, thanks to the non-standard and sometimes confusing interface, but once you get the hang of it, you'll be remixing with the best of them.

The main part of the program shows a circle split into 12 segments, each with three subsections. You load samples into the sections and all samples within a segment play back at the same time. In other words it has 12 tracks, each of which can play up to three samples, and you can select which track to play by pressing keys on the keyboard.

Longer samples can cover segments in two or more tracks, but you can also mix tracks together and load the result into a single track to free up space.

The five Livetool buttons at the top of the screen can hold additional samples that can be triggered on top of

the main loop. The program records changes you make during playback in order to record a complete remix performance. Mixes can't be edited but you can do several takes and each one is stored as a macro. A mix can be saved as a wave file for loading into an audio editor or sequencer.

The program has its own file display area which, like most custom displays is not as obvious as a standard file dialog box or Windows Explorer.

Effects can be added to both the samples in the circle and those assigned to the Livetool buttons. They include chorus, flanger, echo, reverse, pitch

change, filter sweeps, fades and scratches. When a sample has had effects applied to it, the settings can be saved allowing you to build up an effects library. The Shredder breaks a sample into eight parts and lets you change the order in which the parts play back.

The manual is essentially a printed version of the Help file, but it's still useful because instead of opening in a separate window, the Help screen obscures the left third of the program window which means you can't always access the functions that it's telling you about.

DETAILS
★★★

PRICE £5 (£4.26 ex VAT)
CONTACT Time+Space 01837 55200
www.bestservice.de
SYSTEM REQUIREMENTS Pentium 90MHz, Windows 9x, 16MB of RAM, CD-ROM drive, DirectX Media Runtime 6.0, Internet Explorer 4.0 or later
PROS Unbelievably inexpensive and includes all the essential remix features
CONS Non-standard operation and atrocious Help system
OVERALL Deceptively powerful for the price but has a clunky interface

Best Service ReLoop 2

LOOPS ARE AT the core of most dance music and ReLoop can turn one loop into many others! To work optimally, it must use loops that can be split neatly into 16 regular segments that it processes individually.

ReLoop has three display modes. The first shows the position of each segment, numbered 1 to 16, and their volume. The second shows three FX settings and a pan control, and the third contains a filter.

The most interesting thing you can do is change the order of the segments, say, swapping 4 and 8 or putting segment 12 in the first four positions. This is a surprisingly effective way of creating new loops from old. Adjusting the volume of each step can also have a marked effect on the loop. Setting individual pan positions means you can make the drums ping around the stereo image. There are three effects that can be applied to each segment: playing in reverse, playing only the first half, and playing the first half twice. All three are mutually exclusive for each segment. The filters can also be used to change the sound dramatically.

As if this wasn't enough, two loops can be processed at the same time, each with its own parameters with a cross-fade slider to balance the volume between them. The Vector Pad is a sort of 2D on-screen joystick that is controlled by the mouse and changes several parameters simultaneously.

A new loop can be saved as a single wave file or as 16 segments to load into a sequencer for further manipulation.

The program has been written using Macromedia tools, which may explain some of the idiosyncrasies. For example, changes to the Filter slider don't take effect until you release the mouse button

and the loops are not displayed in waveform format.

It would have been nice if all three display modes could be seen at once and the control areas could do with being larger to facilitate finer control. We also didn't like the way the Reset option takes you back to the Volume display.

These are minor points, but could have turned a good program into a great one. And while in niggle mode, the price does seem a tad high.

But in spite of the niggles, ReLoop 2 performs some fascinating functions that every loop enthusiast will appreciate.

DETAILS
★★★

PRICE £59.95 (£51.02 ex VAT)
CONTACT Time+Space 01837 55200
www.bestservice.de
SYSTEM REQUIREMENTS Pentium 166MHz, Windows 9x, 32MB of RAM, CD- or DVD-ROM drive, 16bit audio card with MME driver, 800 x 600 resolution at 16bit colour depth
PROS Lots of innovative loop processing features
CONS Operational niggles; high price
**OVERALL** An excellent new-loops-for-old tool, shame about the interface

Button Zero-X BeatCreator

BEATCREATOR IS a loop manipulator designed to work with drum loops, hence the name, but it can be used with any other type of loop, too. In essence, it slices a loop into hits or segments and then shuffles them around.

The slicing bit is critical in order for the program to work effectively. Hits can be recognised in drum loops by the spike in the waveform at the start of each hit. The program finds these slices automatically and it's very accurate, particularly with drum loops. It can also determine the tempo of a loop. However, there are several tools for adjusting and tweaking the slices manually if you need to do so.

In the Rearrange Events window you can change the order of the slices by dragging them from one position to another. Slices can be played in reverse, one slice can replace another and you can randomly shuffle them around. A Lock function fixes events in place so they won't be randomised. This is fun, easy to do and you'd be amazed at the new loops it can produce.

Another tool is the PCP (Pattern Controller Processor) which also shuffles slices around but it can also apply effects to them. These include
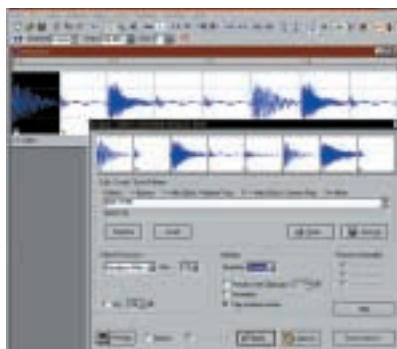
various filters, bass boost, overdrive and volume changes. The filters in particular can add some terrific filter sweep effects to a sample and volume can be used to produce on/off gate effects.

Effects can be applied to specific slices and the strength of the effect varied between slices. This involves selecting values for each slice from a pop-up menu or you can type in a string of numbers specifying the values. This can be a bit laborious but there are lots of presets and examples.

BeatCreator can add itself to Fruity-Loops' Tools menu to be opened from within Image-Line's package. Loops and slices can be imported into FruityLoops

which places the slices on individual channels. The loop will play normally but you can use FruityLoops to change it.

BeatCreator can import wave and SF2 (SoundFont) files – great news for SoundBlaster users. It also allows users without a SoundFont-compatible card to use SFs by importing them, manipulating them if required, and exporting them as a wave file. It can even create a MIDI file for use in a sequencer or with a sampler. This offers additional scope for manipulation. It can also export slices to a hardware sampler via SCSI.

DETAILS
★★★★

PRICE $80 (approx £50) (order online)
CONTACT Button Production
00 46 31 701 72 22
www.beatcreator.com
SYSTEM REQUIREMENTS Windows 95/98/NT4x, the more RAM the better, 16bit sound card, 800 x 600 in 256 colours or better
PROS Good auto-slicing and lots of manipulation functions
CONS Applying effects in the PCP can be a little fiddly
OVERALL An excellent sample loop manipulator

Codemasters Music 2000

IT'S MUSIC SOFTWARE, Jim, but not as we know it. At least it's rather different from all the other programs we're looking at here. For starters, it was originally programmed for the PlayStation where it proved to be hugely successful and was only later ported to the PC. The problem with this is that there aren't a lot of music programs for the PlayStation, whereas there are dozens for the PC.

We hit the first snag when we were trying to get the software up and running. Apparently the copy-protection system isn't compatible with some CD-ROM drives – and our review system obviously had one of these installed. We did get it running under Windows 2000 on a Pentium 200 MMX. Perhaps because of this the mouse pointer didn't move smoothly and was difficult to position accurately.

The look and feel has a game-ish appearance. The graphics are chunky and operation is non-standard. But there is a lot of depth to the software. It's a sample sequencer with 99 tracks. You select riffs (short musical phrases) from the riff library and place them on the

tracks. However, this doesn't work as you might expect. You can't drag a riff to a track; instead you click on it to select it, the riff library disappears, then you can click on the riff to place it on a track.

There are over 1,000 riffs split into categories such as Beat, Drum 'n' Bass and House. They're very good and some of the demo tunes are spot on. You can create your own riffs in the Riff Editor, which is one of the strongest parts of the program. There are 2,000 samples to play with and they pop up in lists but aren't stored as separate and accessible files anywhere. Odd. You can also rip audio from CDs and add effects to samples.

The program also supports video. You construct video sequences much as you construct riffs and the program comes with a library of video clips. You can also play your own CDs through the program and it will generate video sequences to go along with the music.

The pack includes another program called Music Jam which allows up to four people to jam together either online on a LAN or over the Internet, or you can jam alone. This is essentially remixing where participants use keys to trigger samples.

DETAILS
★★
PRICE £34.99 (£29.78 ex VAT)
CONTACT Codemasters 01926 814 132
www.codemasters.com
SYSTEM REQUIREMENTS Pentium 233MHz MMX, Windows 95, 16MB of RAM, 65MB of hard drive space, Direct X 7.0-compatible video card (3D card for creating videos), 16bit SoundBlaster-compatible sound card
PROS Lots of good riffs; online jamming
CONS May not run on your PC; horrendous, non-standard interface
OVERALL It might have been a winner on the PlayStation, but it really doesn't cut the mustard on the PC

Data Becker DJ 2000

DJ 2000 IS ESSENTIALLY a sample sequencing program, but luckily it is awash with features. Pop up the sample library and choose from categories such as Trance, Drum 'n' Bass, Gabba, Pop Music (how did that get in there?), Freestyle, Hip Hop/Rap and House. These open to sub-categories such as arpeggios, bass drum, bass line, hi-hats, lead, hand claps and so on, and then you're down to the actual samples that are simply dragged onto the tracks. The supplied samples in each category are all of the same tempo so they all fit together neatly.

If you fancy a spot of remixing, there's Live Jam which holds 12 samples that can be triggered from the computer keyboard or by clicking on-screen buttons. There are also three slots of one-shot samples. If inspiration is flagging, click the Dice to fill up with new samples and use the Magic Wand to put the program on auto-pilot.

But it's the extra pieces of software that ship with DJ 2000 that make the package. You can create your own loops with BDM 2 (Beat and Drum Machine)

by dragging drum and instrument icons into a central area. They all play a little riff but you can change them using a simple track editor.

The DB 303 is based on Roland's TB-303 bass line synth. You create bass lines by clicking hits onto a grid and there are filter controls to adjust the sound plus Dice and Magic Wand for instant inspiration. The Melody Maker works on similar lines, based on a 16-step grid and with a keyboard for entering notes.

The Vocalizer is where you record your voice or other samples and apply effects such as reverb, delay, phasing

and flanging. The Wave Editor offers audio-editing facilities and includes similar effects to the Vocalizer plus time-stretch, pitch-shift, fades and reverse.

One neat feature is the XPK Packer Player. Save your mix as a compressed XPK file and send it to friends who can play it even if they don't have DJ 2000.

The program comes with a mammoth 3,000 samples spread over four CDs, so when selecting samples you'll often be prompted to insert a different CD, which is a little frustrating.

The graphics are chunky and the colours dull, which gives the program a *Toy Town* appearance. However, if you ignore the presentation you'll find DJ 2000 a very capable program.

DETAILS
★★★★
PRICE £19.95 (£16.98 ex VAT)
CONTACT Data Becker 01420 22807
www.databecker.co.uk
SYSTEM REQUIREMENTS Pentium, Windows 9x, 16MB of RAM, CD-ROM drive
PROS Tons of features and an excellent price
CONS Lots of CD swapping; chunky graphics and naff colour scheme
OVERALL A feature-packed program that can take you beyond the basics

IK Multimedia GrooveMaker 2

GROOVEMAKER HAS BEEN around for over three years but has only recently acquired mainstream recognition. It's the only software we looked at that is also available for BeOS and the Mac as well as Windows.

GrooveMaker is a remixer but with a few differences, the main one being that it can do a remix with the minimum of user intervention. The software skimps a bit on tracks – there are only eight – but by clicking on one of the four Randomix buttons, samples are assigned to the tracks automatically and begin to play straight away. These four Randomix buttons can also be used to randomise the percussion and instrument elements.

Samples are split into seven types such as bass, loop, line and pad, and clicking on a type brings up a list of samples in that group. The Randomix function selects samples from each group. You can make the selections yourself and you can lock samples in order to keep good combinations. Selected combinations can be marked and then dragged into a sequence play list so they play one after another.

You can add melody lines over and above what may be present in the sample with the Arpeggiator. This offers up, down, up/down and random patterns and you select the notes to be played by the Arpeggiator using the on-screen keyboard. Helpfully, this shows which notes are most likely to fit the current song, although you don't have to stick with the suggestions.

You can import loops and a Loop Maker feature helps match the tempo to GrooveMaker's tempo, but this is not carried out automatically. Other features include the Virtual DJ which will automatically create up to four remixes in one go, and then carry on creating more.

The interface is rather futuristic and we found the legend on some of the controls difficult to read. You will need to read the (rather excellent) manual and use the on-screen tutorial as this is the fastest way to get up and running (it's not obvious how to select this – it's the T button).

Once you get the hang of it, Groove-Maker is addictive. The samples are well-chosen and you can have fun seeing what sort of mixes the program generates and take over when it comes up with something interesting. You can also create a complete remix from scratch.

DETAILS
★★★★

PRICE £59.95 (£51.02 ex VAT)
CONTACT SCV London 020 7923 1892
www.groovemaker.com
SYSTEM REQUIREMENTS Pentium 200MHz, 32MB of RAM, 100MB of free hard disk space, CD-ROM, 640 x 480 256-colour monitor, 16bit sound card (SoundBlaster-compatible), PC speakers
PROS Deceptively simple, near-automatic groove creation
CONS Only eight tracks; interface not immediately intuitive
OVERALL The lazy person's remixer – good mixes with little effort

Image-Line FruityLoops

FRUITYLOOPS USES a pattern-based approach to sequencing, rather like analogue drum machines such as the Roland TR-808. You select a pattern from a selection of 999 and program hits by clicking on a row of buttons or dots as the program calls them.

FruityLoops comes in three versions. The standard version is basically for creating drum loops and it includes a simplified Playlist that allows individual patterns to be linked. The Pro version adds a keyboard editor where samples can be pitch-shifted to play bass and melodic lines. It has a graphic editor where fades, pans and filter settings can be drawn in. The Playlist also allows several patterns to be played simultaneously.

The biggy is the TS404 version which includes a bass line synth based loosely on the Roland TB-303, although it has its own sounds and features. It also supports external control via MIDI and you can automate many parameters. In all versions of the software, tracks can be exported as wave and MP3 files.

Patterns can be up to 64 dots long, but every pattern has to be set to the same length. Each track – or channel in Fruity-speak – contains a sample and the program includes some ready-to-go collections. However, you can load any sample, including your own, into any channel. Each channel has its own volume and pan controls and each sample has a Channel Settings window which shows it as a waveform and gives you access to a range of effects, such as reverse, envelope control, filtering, tuning, distortion, reverb and echo. The program also supports DirectX and VST v1.0 (not v2.0 yet) plug-ins.

As well as playing audio samples, patterns can be played via MIDI although most users tend to stick to samples. However, you can also use

MIDI to control parts of the program via Controller messages and VST plug-ins can be controlled via MIDI in real time.

Updates seem to be released regularly and we did experience occasional instability on the latest 2.7 update (it could have been our system), but this didn't detract from what is a very powerful program and great fun to use. You only have to listen to some of the demo songs to see what it's capable of doing. No wonder it has become a standard among dedicated dance music creators.

DETAILS
★★★★★

HIGHLY COMMENDED
PERSONAL COMPUTER WORLD

PRICE Basic $35, Pro $70, TS404 $129 (approx £22, £44 and £80 respectively)
CONTACT FruityLoops
www.fruityloops.com
SYSTEM REQUIREMENTS Windows 9x, 6MB of free hard disk space, DirectX 5.0 or later, Windows-compatible sound card with DirectX drivers
PROS Superb features – drum patterns, synth lines, effects, MIDI control
CONS Non-standard Windows interface; fixed pattern lengths
OVERALL A most powerful drum/synth editor capable of generating impressive music

Magix playR DeLuxe

A REMIXER but much, much more, this has two 'turntables' each with eight slots into which you load samples. You start playback by clicking on them or pressing keys on the keyboard. You can even load two complete songs into both turntables, cross-fade between them and add the samples in the turntable slots on top! Throw in the ability to mix videos and you have what Magix calls an interactive hi-fi, video and remix system.

And we've still only scratched the surface. Songs can be compiled into playlists, played in sequence by the two turntables and mixed live. There are play and stop controls for each turntable plus a position slider that works as a fast-forward and rewind control. You can use the cross-fade slider to cross-fade between them, just like using DJ decks. The tempo can be adjusted manually but you can also sync one turntable to the other so two songs, originally played at different tempos, match up. A time-stretching function enables you to change the pitch without changing the tempo and vice versa.

The program will hunt down songs on the Internet from specified FTP addresses and MP3 Finder searches for MP3 files by artist or title.

The Organiser can scan your hard or CD drive for songs and create a playlist. You can then edit entries. The program supports the CDDB (CD Database) which accesses an online database to download song and artist info to catalogue the CD. You can also convert songs in the playlist to MP3s but after you've done 20 songs you must pay £5.99 to register for the full Qdesign encoder.

Among the many other features is a 19-channel mixer, an FX studio that supports DirectX plug-in effects, and an audio editor that can rip Audio CDs. The software also has useful functions such as EQ, compression, distortion, reverb, noise reduction, fades, reverse and echo. And there's a video option where avi format or live-feed video can be set up and visual effects applied.

The interface is packed with controls so it's not easy to get to grips with at first. We also experienced a few lock-ups, but only when we were trying to do a number of operations at the same time. Nevertheless, playR Deluxe is an impressive piece of software.

DETAILS
★★★★
PRICE £29.99 (£25.52 ex VAT)
CONTACT Magix 020 868 3704
www.magix.net
SYSTEM REQUIREMENTS Pentium 200MHz, Windows 9x/NT/2000, 32MB of RAM, 100MB of free disk space, CD-ROM drive, DirectX 6.1, 800 x 600 resolution with 16bit High-Colour, 16bit sound card
PROS Turntable mixing; video; Internet support; audio editor; effects; music organiser
CONS Complex operation; not totally stable
OVERALL It's difficult to imagine a DJ type not loving this

Arranging techniques

Even though many of the programs we're looking at here are designed to make 'instant' music, there's still an art to putting loops together. If you're just starting out, here are some suggestions, but feel free to improvise and go where your feet and ears take you.

One way to build a track through remixing is to start with a drum loop. Play it for four or eight bars and then add a bass line. Play the two for four or eight bars, then add a vocal. Unless it's a very interesting vocal, you might just want to play this for four bars and take it out of the mix. As you do so, add an arpeggio for four bars. Take this out and add a pad.

Now here's the good bit – stop the drum and bass parts so just the pad is playing in the background and add another sound, say some percussion. Play this for four or eight bars and then bring in the drums and bass again. Get the idea?

It's quite common to see mixes that build up in this way, but they just keep on building and building without dropping out any of the parts. In the end they have nowhere to go!

If more tracks are available, as they usually are with sample sequencing, you can be more creative with the drum parts. The idea is to build up a drum track using individual drums, in much the same way as remixers build up a song.

Start with a kick drum (or bass drum as they say in Blyth). It needs to play an interesting pattern; it doesn't have to be original, just interesting. For example, a two-bar pattern could have a hit on each beat of the two bars (quarter notes) but four beats on the last beat of the second bar (one-sixteenth notes).

Play this for, maybe, eight bars and then add hi-hats on the offbeat, that is in between the main beats. After another eight bars, add hand claps on beats two and four. You could then bring in some additional percussion, say, congas, industrial sounds, metallic noises or whatever fits the style of the music.

That's your basic drum rhythm, now you can add a bass line and other instruments as described above.

The sounds play a major part in dance music, too, so hunt out those deep, dark kick drum samples and moody snares.
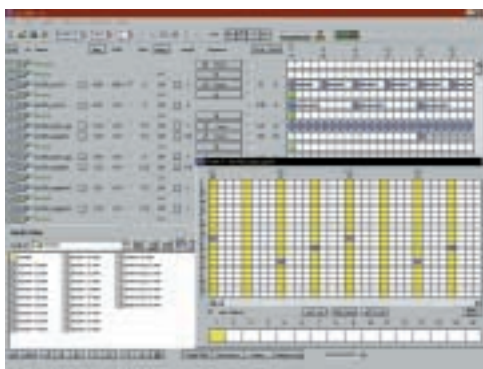
The art of putting loops together takes a bit of getting used to, but practice makes perfect!

Making Waves Audio **Making Waves**

THIS PRODUCT IS a strange, but surprisingly powerful combination of sequencing and sample playing. At first glance the interface seems intuitive and inviting, but once you start to use it, all is not as it seems.

The left of the screen shows tracks that can be designated to use loops, one-shot (non-looped), percussion or note samples. You can change a designation at any time and you need to be in the right mode to work on the sample correctly. For example, with a percussion sample the track shows a small percussion editor where you can click hits onto a grid. To create a drum part you'd use several percussion tracks.

The Note Editor brings up a large grid marked with note names. You create a melody or bass line by clicking hits onto the grid or via a MIDI keyboard. A track can also be designated an effects track and the program has an impressive range of over 20 effects, such as compression, delay, distortion, pitch shifting, flanging reverb and two types of filters. The effects controls are quite simple and based around Windows dialog boxes, rather than the graphic displays we would have preferred.

To the right of the track list is a grid layout split into bars. You simply click onto the grid where you want that track's sample to play. There are cut, copy and paste functions so it's fairly easy to extend a composition. You can also group tracks to change their volume or effects settings in one go rather than tweaking settings for each track.

A Chord sequencer helps you avoid the hassle of fiddling about in the Note Editor trying to create chords. The Note Editor can also be put into timesplicing mode where each pitch plays different parts of a sample. You can adjust effects levels, and a cut-off sequence feature lets you switch off effects for selected parts of a bar. This can be used to create interesting rhythmic effects through rapid on/off changes in volume or cut-off point on the filter and gate effects.

There are mixers for levels, stereo positions and effects, and dozens of pop-up windows for all sorts of functions. A bit more integration would have made the software easier to use.

In spite of its idiosyncrasies, Making Waves is a powerful program, but you'll need to spend time to get the most out of it.

DETAILS
★★★★

PRICE £39.99 (£34.03 ex VAT)
CONTACT Making Waves Audio 0870 303 030
www.makingwavesaudio.com
SYSTEM REQUIREMENTS Pentium or equivalent, Win 95/98/NT4, 16MB of RAM, CD-ROM drive, 16bit sound card, SVGA display
PROS Drum parts and melodies easy to create
CONS Not intuitive and some operations could be better integrated
**OVERALL** A powerful if somewhat non-standard program that takes time to learn

Mindscape **Pro DJ**

ALTHOUGH PRO DJ is one of the least expensive programs in our test, it proves that you can't judge a program by its price. Essentially it's a sample sequencer. Sample loops are listed down the left of the screen and split into categories, such as bass, beat, claps, drum, hi-hats, piano, strings, synth and vocals. Clicking on a category expands the entry (although this is not as neat as Windows Explorer), and you can audition loops and then drag them onto the tracks to the right. The program starts with a dozen tracks and adds more as you fill them up. Samples can be moved and copied by dragging, and extended to any length.

Each sample has a Properties window where you can set the start and end points, volume and pan position. There are also cut-off and resonance controls here. The interesting thing is, you can create different settings for the start and end of a loop and the program will morph between them giving instant filter sweeps, dynamic panning and fades.

Hidden in the depths of the Settings menu is an option to activate surround sound (if your sound card supports it).
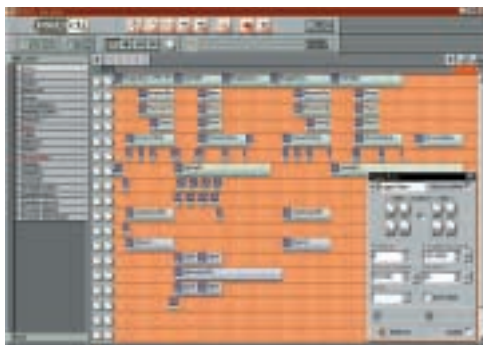
There's also an option to use WinAmp plug-ins although these effects are applied to files on disk rather than in real time to samples within the program, which defeats the object of the exercise.

You can record your own files but there are no edit features here at all, although there is an option to link to a wave editor of your choice. There's a similar option to link to a loop editor.

To import wave files, you place them inside the Pro DJ Samples folder on your hard disk. You can add folders and reorganise the samples and the changes will appear in the samples list. The samples that ship with the software are excellent and varied as the demo songs prove. The Collect Samples function will gather all the samples used in a song into one directory.

The program can also play video alongside the music. You can choose an avi file to play and add your own video files to the video directory. Special text files are used to control the video and if you want to get your hands dirty, you can create these, too.

At least one software games developer has had a hand in the production of Pro DJ and this shows in some of its functions and operations, however the program is still very usable.

DETAILS
★★★

PRICE £9.99 (£8.50 ex VAT)
CONTACT Softkey 01664 481 563
www.softkey.co.uk
SYSTEM REQUIREMENTS Pentium 166MHz or faster, 16MB of RAM, quad-speed CD-ROM drive, SVGA monitor with 1MB SVGA display card, Windows-compatible sound card, DirectX-certified drivers for video and sound (DirectX supplied on disc)
PROS Good collection of samples; easy to use
CONS A little short on extra features
OVERALL Basic and inexpensive sample sequencer capable of good results

Mixman **Mixman Studio**

MIXMAN WAS ONE of the first programs to popularise computer-based remixing and, although new versions have added a few bells and whistles, its modus operandi hasn't changed. The main screen shows two turntables, each with eight 'pads' or tracks. You can assign a sample to each of these tracks. The remixing is done by pressing keys on the keyboard to start, stop and loop the samples. It's as simple as that. If you really get hooked, Spacetoys produces a hardware version of the turntables for around £99, which is much better for hands-on mixing.

In addition, the basic version, Mixman Studio, offers realtime control over volume, pitch, panning and tempo. When you have created a mix, you can export it as a wave file or as an MP3. It also supports SF2 (the SoundFont format), RealAudio's R2 format and its own Track format. This slices up the samples so each slice contains a single hit or note. Load this into a sequencer and you can change the speed of the loop without changing the pitch simply by increasing the tempo. Cubase VST currently supports the Track format. Mixman, however, has very basic recording facilities and you'd be better using a shareware editor for recording.

Mixman Studio Pro has added features such as an Effects Studio where effects can be applied to individual samples, a sequencing screen and an editor that can edit mixes. This is one of the biggest misses in the basic version because if you make a mistake doing a mix there is no alternative but to start again from scratch.

There's also a Mac version called Mixman Studio Mac. It's equivalent to the basic PC version but with a few extras such as realtime MIDI control. But even with these, the Mac premium seems a little high. In fact, the whole range has recently seen a price hike which takes the edge off its appeal.

The program comes with a good range of samples. These are of excellent quality, covering lots of dance genres such as House, Hip Hop, Jungle, Acid-Jazz and Techno. There are a few decidedly non-dance types, too such as R&B, Country and World, although some of these mix well with the main styles. However, there are not many samples and you will need more if you want to produce a few mixes in a particular genre without being repetitive.

DETAILS
★★★★

PRICE £29.95-£59.95 (£24.49-£51.02 ex VAT)
CONTACT Spacetoys 0141 634 0996
www.spacetoys.net
SYSTEM REQUIREMENTS PC version: Pentium II 233MHz or faster, Windows 95/98/2000, 32MB of RAM, 40MB of hard drive space (275MB for full install)
PROS Easy to use and with quality samples
CONS More tracks/samples would be better
OVERALL Remixing doesn't get much easier than this

Propellerhead **ReBirth RB-338 V2**

THE ORIGINAL REBIRTH emulated two Roland TB-303 bass line synths and a TR-808 drum machine, hence the 338 in the name. Version 2 added a TR-909 drum machine but the name stayed.

These are remarkable emulations. They look like the originals, but more importantly sound like them. Each machine has to be programmed in a similar way to the hardware units on which they are based. The system is pattern-based and each module supports 32 patterns that can each consist of 16 steps of notes. This means you select a pattern and then enter a drum or bass line by clicking on a button to select the step and then clicking on more buttons to select the note – just like the real thing.

However, its authenticity is also its drawback because programming is fiddly and there are easier ways to get the same result using software samplers and sample-based drum software. But, its adherents claim, that's to miss the point. ReBirth embodies the true spirit of analogue synthesis.

Although the main sections are hardware emulations, there are some software concessions. For example, each instrument has a mixer section with pan, volume, distortion, filter, compression and delay controls. The effects in particular can enhance the sound.

You can also twiddle the controls in real time and record them. This is primarily used with the cut-off and resonance filter controls in the 303 sections that produce classic filter sweep effects electro music pioneers recorded the old fashioned way – onto tape!

If you want a change from standard sounds, you can apply a Mod which can change both ReBirth's appearance and the samples it contains.

Although many people produce entire 'songs' using ReBirth, others want to add other sounds such as synths or vocals and effects. You can do this by exporting the pattern as a wave file or by syncing the program to a sequencer. If the sequencer supports ReWire (as do Cubase VST and Logic), it ensures rock-steady synchronisation and Rebirth's output is fed to its mixer where more effects and processing can be applied.

ReBirth, quite simply, is a classic and if you like retro, you'll love this. However, if you're new to music on the PC there are other easier ways to do what it does, without the fiddly pattern-based programming.

DETAILS
★★★★

PRICE £149 (£126.81 ex VAT)
CONTACT Arbiter Pro Audio 020 8207 5050
www.propellerheads.se
SYSTEM REQUIREMENTS Pentium 90MHz, Windows 95/98/NT, 16MB of RAM, 16bit audio card. For full use of all features and/or integration with Steinberg Cubase VST, a faster CPU and more RAM is required
PROS Excellent Roland instrument emulations at a fraction of the price
CONS Fiddly to use
OVERALL A classic drum and bass line emulator for analogue retro fans

PXD Musicsoft **Dance eJay 2**

THE UPPER PART of eJay's main screen shows 16 tracks while the lower part lists the samples, which are dragged onto the tracks to create a song. A track can hold several different samples unlike some software that reserves one track for each sample.

There are 12 types of samples, such as loops, drums, bass, guitar, rap, voice, and effects. You can import samples but there's no provision for recording within the program. However, there are many freeware or shareware audio editors.

Samples automatically snap to the nearest bar, which makes positioning them easy, and you can adjust the start and end positions of a sample by dragging markers within the sample itself. Each sample has its own volume control, too, and there's a mixing desk where the volumes of each track can be adjusted and channelled to the left or right stereo speaker.

The Groove Generator is a drum editor for creating patterns that run through the song. The drum grid is limited to 16 notes which may be fine

for a lot of music, but as you advance you might find it restricting. You can select the 10 samples to be used in a drum set, set individual drum volumes and pan positions, make a sample to play in reverse, and apply filtering, echo and distortion to the overall kit.

The Effect Studio applies effects to individual samples. Options include a filter with overdrive, echo, robotise, distortion and volume. The pitch can be changed but this is accompanied by a corresponding change of tempo, limiting its usefulness. However, there is also a separate time-stretching section where the duration or tempo of a sample can

be changed without a corresponding change of pitch, which is more useful.

There are several other eJay programs, the main difference being that the samples are dedicated to a particular dance genre. There's Hip Hop 2 and Techno, plus three Megapacks.

The program looks like it was designed with Mickey Mouse's paintbox. The whole thing screams 'fun', not 'pro' but this does a great injustice to the power and capabilities of the software. Dance eJay is fun to use, extremely intuitive and in spite of the colour scheme, it can also produce some great-sounding songs.

DETAILS
★★★★

PRICE £29.99 (£25.52 ex VAT)
CONTACT FastTrack 01923 495 496
www.fasttrack.co.uk/www.ejay.com
SYSTEM REQUIREMENTS Pentium or higher, Windows 9x or NT4, 16MB of RAM, 40MB of free disk space, quad-speed CD-ROM drive, 800 x 600 screen, 256 colours, sound card (compatible with Direct Sound)
PROS Easy to create great-sounding songs
CONS Dodgy colour scheme – wear shades
OVERALL Fun software you simply can't go wrong with

What the professionals use

Although the software we've reviewed is aimed at the non-professional, we'd be surprised if more than one artist had not whiled away a few hours playing with some of them.

Dance music was traditionally created with hardware samplers such as those by Akai, Roland, Yamaha and Emu. Many dance music creators are DJs rather than performing musicians, and using hardware does not require a knowledge of notes and music theory. It does, however, require a good ear and a good sense of sound and rhythm.

Although many dance musicians still use hardware, an increasing number are turning to software. It's more powerful, essentially easier to use and much cheaper, too. Samples are still used for the core of the music and many people use professionally produced sample CDs. However, the dedicated and 'true' dance music producers

create their own samples and process existing samples.

The software they use includes ReBirth as reviewed here, which is very popular with the Acid and analogue synthesis fraternity; and Sonic Foundry's Acid Pro, the upmarket version of Acid Music, which is used to create sample sequences. Sample editing and processing are performed with dedicated audio editors such as Steinberg's WaveLab, Sonic Foundry's Sound Forge and Syntrillium's Cool Edit 2000 on the PC and Bias' Peak and TC Works' Spark on the Mac. Other tools include Steinberg's ReCycle for both PC and Mac which can split a loop into its component samples, allowing you to substitute one sample for another and process individual samples within the loop.

To bring everything together, most musicians use one of the major sequencers such as Cubase VST, Logic Audio or Cakewalk. These all integrate audio and MIDI

recording, allowing synth modules to be easily added to the production. Even if a song is totally sample-based, these sequencers have excellent multi-track arranging facilities, and many audio-editing and processing functions, too.

Many musicians are moving towards software samplers that integrate into the sequencing environment. These include BitHeadz' Unity DS-1, Seer Systems' Reality, Nemysy Gigasampler, and Emagic's new EXS24.

There is a host of digital audio plug-in software that also becomes part of the recording

Pros hack samples together with tools such as Sound Forge and Akai samplers

environment that can totally transform a sound. These range from common effects such as reverb, delay, chorus, flanging and phasing, to sonic enhancers that boost the bass frequencies, heavy filters to produce sweeps, and audio processors such as GRM Tools that can take a sample apart and reconstruct it as the audio equivalent of Frankenstein.
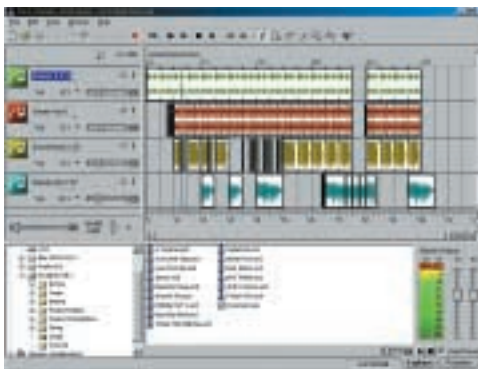
Experimentation is still the name of the game.

Sonic Foundry **Acid Music 2**

ACID WAS THE first sample sequencing software to target the professional and serious amateur musician market – it also had a price tag to match at £249. Sonic Foundry has since upgraded and split Acid into high- and low-end products. Acid Pro 2 retains the serious focus of the initial product, while Acid Music 2 is aimed more at those starting out in the sample sequencing world. Acid Music flavours cover different genres of dance music and work exactly like the pro version but have fewer features.

Acid Music 2 supports an unlimited number of tracks – each sample in a song is given its own track. Whenever you want a sample to play, you simply paint it onto its track. Automatic time-stretching and pitch-shifting can be applied to the sample sequencing process, so a sample can fit a tempo without changing its pitch or you can adjust the pitch of a sample without changing its length.

This isn't magic – the information is stored in the wave file. Sonic Foundry's audio editor, Sound Forge, and its smaller brother, Sound Forge XP, both have features for setting the time-stretch and pitch-shift attributes of a wav file. Nevertheless, Acid Music will have a pretty good bash at working these out itself from raw wave files so you don't need to edit every sample.

There are eight built-in effects, however, DirectX plug-ins like Acid Pro are not supported so you can't add any more. The volume and pan position of each track can be adjusted individually.

Songs can be saved in wave, MP3, Windows Media and RealMedia G2 formats. Surprisingly, it also has a burn to CD option which is great for writing a few songs, but the serious CD compiler will want more control over the tracks.

Other Acid flavours include Acid Rock, DJ, Hip Hop, Techno and Latin and come with around 600 samples. They also support an unlimited number of tracks, but lack Acid Music's onboard effects and CD burning feature. At £39 each, however, potential buyers may not see that as a serious problem.

The design of all the programs very much says 'pro' and they are a delight to use. Serious users will want Acid Pro, but for the rest of us one of the Acid packs will keep us out of mischief for ages.

DETAILS
★★★★★

PRICE £39-£79
(£33.19-£67.23 ex VAT)
CONTACT SCV London 020 7923 1892
www.sonicfoundry.com
SYSTEM REQUIREMENTS 133MHz processor, Windows 9x/NT4/2000, 32MB of RAM, 8MB of free hard-disk space, CD-ROM drive (for installation from a CD), Windows-compatible sound card, DirectX Media Runtime 6.0, Windows-compatible sound card, Internet Explorer 4.0 or later
PROS Powerful software, intuitive to use
CONS No support for Direct-X plug-ins
OVERALL Serious sample sequencing software at an affordable price

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Techland **Future Beat 3D**

THIS PIECE OF software is unique in that it supports 3D audio. Samples can be positioned in 3D space using the 'radar' display situated at the bottom of the screen. It also supports environmental audio on sound cards such as the SoundBlaster Live!

The main screen shows the Simple Editor which is essentially used for remixing. The program can hold up to 64 samples that are organised into four banks of 16. Up to 16 samples can be remixed at any one time by assigning them to the 16 buttons in the middle of the screen and then clicking on them or triggering them via MIDI. Each one can be positioned in 3D space by putting a cross on the display below. The position can also be changed in real time by dragging the cross while recording.

The Track Editor is for sample sequencing. It contains one track for each of the 64 samples and you just place samples on the tracks by drawing them in. This offers greater control over the creation of a mix. The program automatically time-stretches new samples to match the first one loaded.

The Solo Composer is a kind of sample player. The screen shows a five-octave keyboard. Sample instruments are assigned to the keys and notes are clicked onto a grid to create melodies. You can also control this via MIDI, too. It's not quite as sophisticated or straightforward as a dedicated software sampler, but it is useful nonetheless.

There is also a grid-based Drum Editor that can hold 20 drum samples. Drum patterns are created by clicking hits onto the grid of 32 sections. It always runs at the same tempo as the current song, which is useful. There is a 'stop beat' feature that stops a drum sample playing, a similar effect to muting the drum track by hand.

You also get a separate wave editor program with simple edit functions that can add effects such as echo, delay and chorus. It can also generate waveforms such as sine, square, sawtooth and triangle.

The program's interface is a little lacklustre, but otherwise it has a good range of features and it's certainly capable of producing good-quality results. The 3D effects are very interesting and add another, er dimension, to the output. If you want 3D, this is the only program in this group test that offers this facility.

DETAILS
★★★

PRICE £20 (£17.02 ex VAT)
CONTACT Techland 00 48 62 7372228
www.techlandsoft.com
SYSTEM REQUIREMENTS Pentium 133, 16MB of RAM, 16bit sound card supported by Direct Sound
PROS Remixing, sequencing, drum and melody editors plus 3D audio
CONS Uninspiring interface
OVERALL Very usable program and the only one with 3D support

Table of features

MANUFACTURER	ALUDRA	BEST SERVICE	BEST SERVICE
PRODUCT	BEAT 2000	MEDIA DJ	RELOOP 2
Price (ex VAT)	$39.95	£5 (£4.26)	£59.95 (£51.02)
Distributor	Aludra	Time+Space	Time+Space
Telephone	001 416 638 6989	01837 55200	01837 55200
URL	www.aludra.com	www.bestservice.de	www.bestservice.de
Platforms	PC	PC	PC, Mac
Remixing	✔	✔	N/A
Sample sequencing	✔	✗	N/A
Drum editor	✔	✗	Specialised
Melody editor	✗	✗	Specialised
Audio editor	✔	✗	✗
Number of tracks	20	12	N/A
Effects	✔	✔	✔
Time-stretch	✔	✔	✔
Export as audio	✔	✔	✔
Save as MP3	✗	✗	✗
Number of samples	290+	2,000+	1,000+
Record your own	✔	✗	✗
Import Waves	✔	✔	✔
Other CDs available	✗	✔	✗
MIDI support	✗	✗	✗

Table of features

MANUFACTURER	MAGIX	MAKING WAVES AUDIO	MINDSCAPE
PRODUCT	PLAYR DELUXE	MAKING WAVES	PRO DJ
Price (ex VAT)	£29.99 (£25.52)	£39.99 (£34.03)	£9.99 (£8.50)
Distributor	Magix	Making Waves Audio	Softkey
Telephone	020 8868 3704	0870 303 030	01664 481 563
URL	www.magix.net	www.makingwavesaudio.com	www.softkey.co.uk
Platforms	PC	PC	PC
Remixing	✔	✗	✗
Sample sequencing	✗	✔	✔
Drum editor	✗	✔	✗
Melody editor	✗	✔	✗
Audio editor	✔	✗	✗
Number of tracks	16	128	Unlimited
Effects	✔	✔	✔
Time-stretch	✔	✔	✔
Export as audio	✔	✔	✔
Save as MP3	Limited	✗	✗
Number of samples	1,000+	2,000+	1,200+
Record your own	✔	✗	✔
Import Waves	✔	✔	✔
Other CDs available	✔	✗	✗
MIDI support	✗	✔	✗

Button Production	Codemasters	Data Becker	IK Multimedia	Image-Line
Zero-X BeatCreator	**Music 2000**	**DJ 2000**	**GrooveMaker 2**	**FruityLoops**
$80	£34.99 (£29.78)	£19.95 (£16.98)	£59.95 (£51.02)	Basic $35, Pro $70, TS404 $129
Button Productions	Codemasters	Data Becker	SCV London	FruityLoops
00 46 31 701 72 22	01926 814 132	01420 22807	020 7923 1892	N/A
www.beatcreator.com	www.codemasters.com	www.databecker.co.uk	www.groovemaker.com	www.fruityloops.com
PC	PC, PlayStation	PC	PC, Mac, BeOS	PC
N/A	✔	✔	✔	✗
N/A	✔	✔	✗	✔
Specialised	✔	✔	✗	✔
Specialised	✔	✔	Arpeggiator	✔
Specialised	✔	✔	✗	✔
N/A	99	32	8	Unlimited
✔	✔	✔	✔	✔
✔	✗	✔	✗	✔
✔	✔	✔	✔	✔
✗	✗	✗	✗	✔
0	3,000+	3,000+	1,000+	1,100+
✗	✔	✔	✔	✗
✔	✔	✔	✔	✔
✗	✗	✔	✗	✗
✔	✔	✗	✗	✔

Mixman	Propellerhead	PXD Musicsoft	Sonic Foundry	Techland
Mixman Stuidio	**ReBirth RB-338 V2**	**Dance eJay 2**	**Acid Music 2**	**Future Beat 3D**
£29.95-£59.95 (£24.49-£51.02)	£149 (£126.81)	£29.99 (£25.52)	£39-£79 (£33.19-£67.23)	£20 (£17.02)
Spacetoys	Arbiter Pro Audio	FastTrack	SCV London	TBA
0141 634 0996	020 8207 5050	01923 495 496	020 7923 1892	00 48 62 737 2228
www.spacetoys.net/www.mixman.com	www.propellerheads.se	www.fasttrack.co.uk/www.ejay.com	www.sonicfoundry.com	www.techlandsoft.com
PC, Mac	PC, Mac	PC	PC	PC
✔	N/A	✗	No	✔
Some versions	N/A	✔	✔	✔
✗	✔	✔	✗	✔
✗	✔	✗	✗	✔
✗	✗	✗	✗	✔
16	N/A	16	Unlimited	64
Some versions	✔	✔	✔	✔
✗	N/A	✔	✔	✔
✔	✔	✔	✔	✔
✔	✗	✗	✔	✗
550+	N/A	1,000+	600+	1,000+
✔	✗	✗	✔	✗
✔	✔	✔	✔	✔
✔	✗	✔	✔	✗
✔	✔	✗	✔	✔

Editor's **Choice**

Picking an overall winner from these 16 packages has not been an easy task because some only offer remixing or sample sequencing, while some offer both, and others are dedicated to loop manipulation. The best package for you depends on what you want to do and how you want to work. With only one exception, we felt all the programs have something to offer so it's worth looking at them all before making a buying decision.

For example, if you're only interested in remixing, there are several packages to choose from. A major consideration here is the number of samples you get with the program. You can always buy additional CDs, but the more you get with the program initially, the more varied your palette of sounds will be right from the outset. DJ 2000's 3,000 samples is an impressive number and to find 2,000 in Media DJ represents remarkable value for money.

If you'd like the program to help, GrooveMaker and DJ 2000 can perform automatic remixes, although this may leave you wondering what your purpose in whole grand scheme is – other than to listen to the results.

Magix's playR DeLuxe is very different to the other products on test because it combines all sorts of facilities for audio playlist organisation and maintenance plus MP3 searching. And you can remix and cross-fade between two songs in a very similar way to how DJs work.

If you're primarily interested in manipulating loops, ReLoop 2 and Zero-X BeatCreator are the programs to look

at. They can turn a loop inside out, upside down and back-to-front. They're both useful, but BeatCreator has the edge in terms of flexibility and price, and it looks more professional than ReLoop.

The winners

If picking an overall winner was hard, the Highly Commended awards were even more difficult. Notwithstanding our general feeling that the user interface should be based on Windows standards, we felt that FruityLoops has enough power and high-end features to warrant a Highly Commended award.

It combines drum, bass and synth-line creation with a super set of dance music samples. Other samples can be used and saved with the song for easy distribution to other FruityLoops users. It has effects, very powerful synth-type controls and it can save songs directly as MP3 files for posting on the Internet. It uses a pattern-based approach to music creation and while it may not be every-one's preferred method, many users who don't 'read the dots' will find it intuitive.

Although many people like working with patterns, many others prefer the more 'traditional' approach of sequencing where music parts are laid out on tracks. This makes it very easy to see where the parts fit in relation to each other. This is the way most professionals work and becoming familiar with sequencing principles stands you in good stead should you later want to move a step up the music production ladder. Of course, there's no reason anyone should not use a combination of methods, as

those who use ReBirth do when they run it in tandem with a sequencer.

Bearing in mind our ease-of-use criteria, we found the eJay series hard to beat and it gains our second Highly Commended award. If you're not particularly music literate or if you just want to 'have a go' at creating dance music this will do the job without taxing your grey matter or your wallet too much. Don't be misled by the colour scheme and layout which suggests it's aimed at the younger user. It's a very competent program that is fun to use. It almost defies anyone not to put some loops together to create a good dance tune.

Like eJay, many pieces of software in our test support sample sequencing, but we have decided to give the Editor's Choice award to Acid Music 2. The ease and simplicity with which samples can be arranged on the tracks, coupled with the automatic adjustment of tempo and pitch to match the song make this a delight to use. It features pro effects, and the ability to save files in MP3 format makes it ideal for preparing music for posting on the Internet. If you want to expand your music-making potential, there is a large range of add-on CDs and you can 'Acidise' your own loops with the Sound Forge or Sound Forge XP editors.

Although other programs work in similar ways, Acid Music's Windows-based design will be familiar to all PC users. It uses a standard Explorer-based window for selecting samples instead of trying to reinvent the wheel like some of its competitors do when it comes to menus and dialog boxes.

Easy-to-use Acid Music includes pro effects
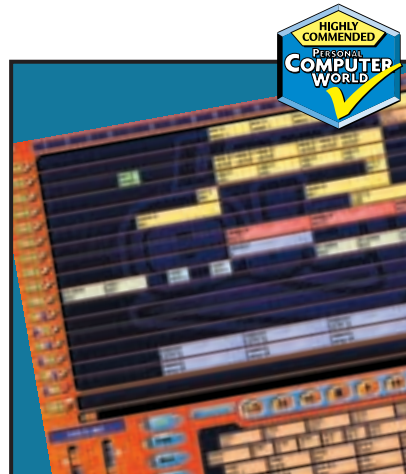
eJay is fun to use – check out the loops

FruityLoops has a lot of high-end features

pcwexpert

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PHOTOGRAPH PATRICK LLEWELYN-DAVIES

With inkjet printers almost as ubiquitous as Qwerty keyboards **pcwexpert** takes a closer look at their beginnings, how they work and what the future holds. Our workshops also offer some essential tips on how to achieve the best results when printing out pictures and how to connect your printer to a network

inkjet printers

Written by Nik Rawlinson

Making an impression

When Gutenberg invented moveable type he started a revolution that has culminated with printers becoming ubiquitous

At the end of 1999, the UK media widely praised Shakespeare as the man of the millennium. There is no denying that his work has had a profound influence on modern society, but it is only because the means are in place to print and distribute his work quickly and cheaply that he has not been long forgotten. Perhaps for this reason the decision by an international body of scientists that it should instead be Johann Gutenberg who receives the title is worthy of more attention.

Gutenberg was born in the German city of Mainz around the year 1400, although nobody can be quite sure of the exact date. At about the age of 35, he moved to Strasbourg, where he stayed for 10 years and trained as a goldsmith and gem cutter. However, at the same time he was secretly developing a revolutionary new kind of printing press. Gutenberg had originally been printing indulgences, which people would buy to cleanse themselves of sin and by doing so hopefully assure themselves a place in Heaven. However, using traditional printing methods this was a lengthy and drawn out process –

something needed to be done, and it was. Gutenberg soon had the realisation that by building a simple frame into which he could slot a series of metal letters of uniform size he would be able to tailor his output at minimal cost. All sorts of indulgences could be printed with minimal effort and without having to create brand new printing plates on each occasion. Mass-market printing was born.

Inkjet printers: 2000 years in the making

His imagination fired, Gutenberg next embarked on printing a Bible. Around 200 copies were produced, but still they were expensive. The year was 1450 and back then each cost the equivalent of three years worth of the average clerk's pay. Sadly, most of these Bibles are long gone with only 20 known still to exist

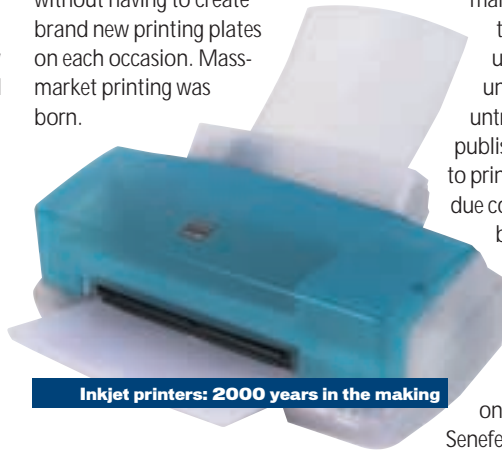today. Gutenberg died 18 years later, in 1468.

Almost 350 years later Aloys Senefelder made a discovery that would assure him a place in history. This struggling Bavarian writer was having little luck getting his work published and so resorted to doing the same as so many others who find themselves unpublished, unpublishable, or untrusting of publishers – he decided to print his own work. In due course, Senefelder brought about the birth of a new technology – lithography. Meaning quite literally 'writing on stone', Senefelder's earliest efforts had involved engraving large stone plates.

However, harassed by his mother who could one day find no paper on which to write a list, he grabbed the two things closest to hand – an unused piece of his stone stock and a mixture of wax, soap and lampblack, which was what he used as the basis for his ink. But rather than washing the

mixture from the stone once the list was complete, he had the bright idea of using it as the basis of an experiment. He washed the stone with aqua fortis (nitric acid) and where it had not been inked with his special mixture it was etched – lithography had arrived. He had created, in effect, an oversized stamp of his own handwriting and in the process produced one of the first examples of ink being used in a carrier solution.

In 1818, Senefelder wrote up his findings, which were published in Munich and Vienna, before later being translated into both English and French. The British version was published by Rudolph Ackerman, so it's not surprising that he also became joint owner of the first lithographic press in the UK.

It was perhaps inevitable that Gutenberg and Senefelder's work should eventually come together and in 1783 British inventor Thomas Bell produced the first intaglio printing press. The word 'intaglio' is derived from the Italian for 'engraved', and it pretty much describes the process involved. Bell's machine was a rotary device onto which could be slotted engraved plates,

pcwexpert timeline

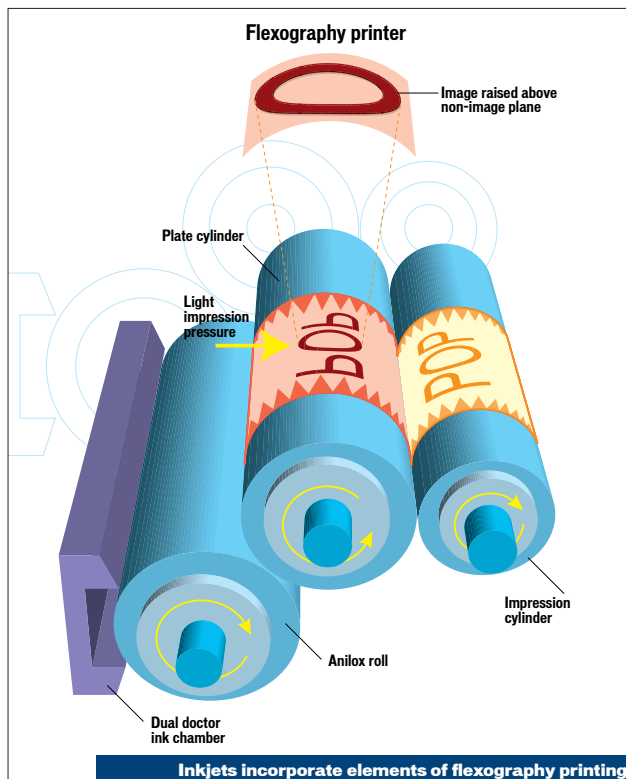| 0000	Until 1400	1430s	1780	1783	1949
The Ancient Egyptians develop what is arguably the earliest dot matrix printer - the hammer and chisel - to carve their history onto stone walls.	**Printing with ink onto paper was developed, but required the use of specially smelted or carved plates that were a mirror image of what was to be printed.**	**Gutenberg develops his revolutionary printing press with moveable characters, allowing him to customise the printed output on the fly.**	**Struggling writer Aloys Senefelder discovers lithography when he wrote on a stone with a piece of wax. He later etched the stone to use it as the printing plate.**	**Thomas Bell builds the first intaglio printing press, which had slots for engraved plates to go in. This method is now used for printing UK bank notes.**	**Tally Corporation founded. It goes on to develops the first line-matrix printer, using a row of pins to hammer images onto the page through an inked ribbon.**

much like characters could be fixed into Gutenberg's frames. The printing press was now a truly modular device meaning that countless publications could be produced each year at minimal cost.

At the end of the 19th Century and start of the 20th we saw the birth of flexography. Originally christened the aniline printing process, its name was changed in the 1950s in an effort to disassociate it from the health concerns raised in connection with the original form of coal-tar based aniline ink used in the early days. The flexography printer was in effect a single large roller in the middle of a series of printing units, each laying down water-based ink, much like that found in many present-day inkjet printers.

In 1949, in the state of Washington, the Tally Printer Corporation was founded. Back then it was producing only paper tape readers but 20 years later, in 1970, it went on to invent what it called line-matrix technology. In this, a long line of pins would hammer an inked ribbon onto continuous sheets of paper to make up characters. Even today this remains the most cost-effective and reliable way of printing data, but its use is largely confined to situations where long, unattended print runs are required.

The line-matrix printer was

Flexography printer

Image raised above non-image plane

Plate cylinder

Light impression pressure

Anilox roll

Impression cylinder

Dual doctor ink chamber

Inkjets incorporate elements of flexography printing

too big for home use and so, to make it appeal to the mass market, the print head had to shrink. This meant that it was no longer able to span the full width of the paper and so the moveable head was born. Whether carrying its ribbon with it, or sandwiching a long fabric tape between the pins and the full width of the page, this new form of producing permanent copies of the ethereal images on a computer screen

soon became as ubiquitous as the Qwerty keyboard.

In 1984, Apple released the Macintosh and the Apple LaserWriter was hot on its heels. These communicated using PostScript, developed by Adobe, and the printer driver was born. No longer did programmers necessarily have to write a set of instructions for every printer it was likely a user would own – instead they could write software

that would send its output in PostScript format and hardware manufacturers now had a standard to which they could build. The other benefit, of course, was that being platform agnostic it made it easy for manufacturers to build printers for more than one operating system in short spaces of time.

The necessary kit was not cheap, though, and remained out of the reach of most home users. Even today many consumers consider their pockets too shallow to accommodate a laser printer. It was the inkjet, therefore, that stole the dot-matrix printer's crown.

The two printers that did it were the ThinkJet from Hewlett-Packard and, in 1985, Canon's BJ-80. This was the result of eight years of development, and it's the story of that development that we'll tell over the next few pages.

Since then, printers have come a long way, and their stats make impressive reading. Hewlett-Packard's latest DeskJets, for instance, feature three-colour printing heads, each containing no fewer than 408 individual nozzles that lay down ink at a rate of 7.3 million drops a second. It's all a long way from the continuous flow of ink droplets, deflected by electro-static beams that were the basis of the earliest inkjets, which is where we pick up the story over the page.

1964	1964	1972	1984	1985	TODAY
The Seiko Group develops the EP-101 (Electronic Printer-101). Offspring products are considered the SON of the EP, hence Epson is born.	**Richard G Sweet patents the Fluid Droplet Recorder, which deflects sprayed ink either onto the page or into a waste well. The first inkjet printer.**	**Stemme develops the Piezo electric printer, the first inkjet able to halt the flow of ink when it encounters a part of the image that doesn't need coverage.**	**Apple launches the Macintosh computer and LaserWriter printer. This revolutionises the consumer and business printing markets.**	**Canon launches the BJ-80 printer, the first truly commercially viable thermal inkjet printer, making the technology available to the masses.**	**Inkjet printers are almost as common as the Qwerty keyboard, providing a quick and easy way to produce high-quality, affordable output.**

The art of reproduction

Today's inkjet printers owe a lot to developments made in the past 40 years, but the perfect printout remains elusive

The birth of the inkjet printer as we know it came at the end of a long period of gestation. On 25 March 1964, Richard G Sweet of Philadelphia filed one of the earliest patents relative to the technology. In this he detailed an invention that he called a Fluid Droplet Recorder. It may have seemed logical at the time, but the principles behind it were much more complex than those employed in modern-day units. The Fluid Droplet Recorder was designed to emit a stream of uniformly spaced drops of a writing 'fluid'. These small quantities of what was effectively ink were electrostatically charged so that some could then be magnetically deflected onto the paper or whatever was to be used as the recording medium. The remaining droplets, those that were not needed, were then deflected by similar means, so that they never came into contact with the paper.

By 1966 Carl Hellmuth Hertz and Sven-Inge Simonsson had come up with their own method of directing ink onto a page. The Hertz process, as it became known, involved generating a mist of spray by continuously vibrating a print head. As in Sweet's implementation, an electric field would then be applied in the space between the print nozzle and a charging electrode, and this would be modulated to control the dispersion of the mist so that precise gradation could be achieved. As you might guess the undesirable side effect of this process was an inky fog that settled on every page you printed.

This kind of printer, where the ink was directed mid-flight by an electronic force field, became known as an 'inctronic' writer and, when perfected, many examples were capable of printing up to 120 characters a second. This was very fast given the state of technology at that time, but the device had two big

problems. First, the stream of droplets could not be shut off and so any unwanted ink had to be collected in a chamber when not being written to the page. This was wasteful, but the second problem was potentially more serious, affecting the very working of the machine itself. Because inctronic writers relied so heavily on deflecting and directing electrostatically charged particles they were susceptible to interference from neighbouring

Inkjet printers owe a lot to accidents as well as developments

magnetic fields. Printers with multiple heads were therefore pretty much out of the question. Clearly a solution had to be found, and it was, by Swede Nils Gustaf Erick Stemme at the beginning of 1972.

He successfully filed for a patent, issued two and a half years later, under the less than snappy title: 'Arrangement of Writing Mechanisms for Writing on Paper with a Coloured Liquid'. This new invention centred on splitting the print head chamber into two parts, one inner and one outer. A channel connected to the outer

chamber feeds it ink from a well while the inner chamber is connected to a vibrating Piezo element for adjusting its internal pressure. By rapidly increasing the pressure within the inner chamber the outer chamber is compressed and ink is ejected from nozzles in a foil wall at the front. Key to the method's success was the fact that all liquids maintain a uniform level of surface tension and this causes two things. First, a capillary action drew more ink from the well into the outer chamber to replace that ejected through the nozzles. Second, because the nozzles were so small the ink's surface tension alone was

sufficient to effectively plug the hole and stop unwanted ink running out. It seems like common sense these days, but Stemme's invention was radical in that it only ejected ink when it was needed.
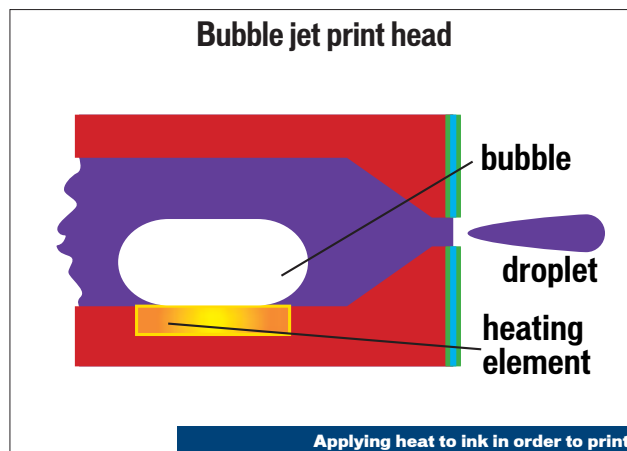
There were a number of clear benefits to Stemme's invention. It overcame the problem of interference from neighbouring electromagnetic fields and it led to a significant reduction in the size of the printing mechanism. It also gave engineers much more freedom when designing inks – up until this point it had been necessary to use a conductive

medium. Perhaps most important, though, was that it greatly accelerated the printing process. The number of characters that could be laid down on the page leapt from 120 per second to over 1,000. The only downside, it would seem, was that sourcing Piezo elements in sufficient quantities to meet demand was far from easy.

Perhaps the most important patent to be filed, however, appeared 14 years later. In the latter half of the 1970s, Canon's Product Technology Research Institute was developing the next generation of copying machines, and this work involved research into inkjet printing. Sufficient development was made for the company to set up a dedicated Inkjet Research and Development Group within the Institute with the express objective of putting Canon at the forefront of inkjet printing technology.

The Group's beginnings were humble, sited in a small laboratory with only two desks and a minimal number of measuring instruments. Its work was devoted entirely to developing the ideas that were already in place using Piezo-electric energy to pressure ink through a nozzle but a minor accident changed the course of the company's work forever. A scientist unintentionally touched the needle of an ink-filled syringe with the tip of a hot soldering iron. The liquid sitting in the needle heated rapidly, expanded, and spat out of the open end. Canon's engineers realised that perhaps heat, rather than physical movement, could be harnessed to form the basis of a high-capacity inkjet print head, and so began a period of eight years of intense development.

By 1979 the number of nozzles in a print head had leapt dramatically, and two years later Canon was the darling of the mass media when, at the Canon

Piezo print head

droplet

Piezo element

vibration plate

Using pressure to put ink onto the page

Bubble jet print head

bubble

droplet

heating element

Applying heat to ink in order to print
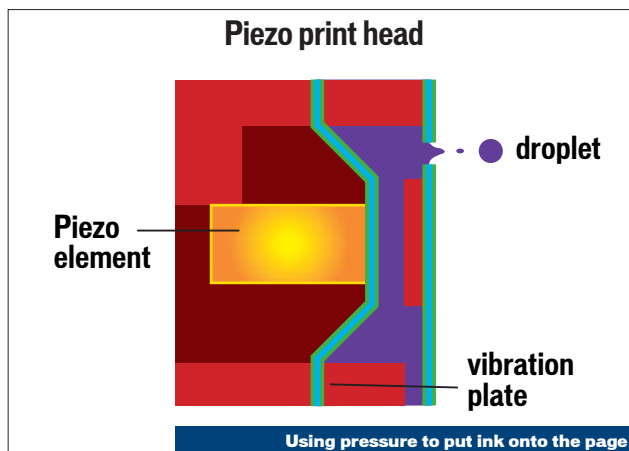
Grand Fair, it demonstrated its bubble-jet printing method for the first time. Public reaction was favourable, both in Japan and overseas. The company pushed ahead with its development and four years later, in 1985, released the world's first affordable wet ink printer, the BJ-80.

This printer was the basis of perhaps the most important patent in inkjet printing history as, on 6 February 1986, Canon detailed a complete description of what had by now become the bubble-jet concept. An element would rapidly heat ink in a nozzle. The ink would turn to gas, expanding in the process, and forming a bubble in front of the element. This bubble would then push ink out through the open end of the nozzle, the gas would be expelled, the heating element would cool and ink from a reservoir would rush in to fill the area vacated by the heated ink.

Canon also discovered that it was possible to vary the amount of ink ejected by adjusting the temperature of the heating element behind every orifice,

Canon discovered that you can vary the amount of ink by adjusting the temperature

hence boiling more or less of the ink and controlling the size of the gas bubble formed. You can see how this works using a regular kitchen kettle. Fill it up, switch it on and wait. As it gets closer to boiling point you'll notice that the bubbles produced become larger and more violent, and the water in the kettle, if you leave the lid off and keep sufficiently far back to avoid getting splashed, will jump higher and higher out of the top. Therefore, the hotter the heating element behind each nozzle in the print head, the greater the amount of ink ejected.

This new bubble-jet mechanism would make it easy to construct heads of multiple orifices relatively cheaply and to use inks that need not be conductive. Canon also asserted in its patent application that it would provide 'a clear image without satellite dots or background fog' – impressive indeed. There is no denying that this was perhaps one of the most important advances along the road toward affordable, high-quality inkjet printers suitable for the home market, but it is a discovery, like many great advancements of technology, that was made by accident.

The inkjet as we now know it had been born, but like a child that grows up it changed over time as three leading manufacturers, Canon, HP and Epson, developed and enhanced what was already in place.

Ink and water

A problem common to most inkjet printers is the actual

amount of ink they can handle at any one time. Only around two per cent of what is laid down on the page is pigment or colourant. The remaining liquid is a mixture of water (around 70 per cent), used as a transport medium, and ethylene glycol (around 30 per cent), which maintains the levels of viscosity necessary to achieve the capillary action that will draw more liquid into the head once a drop has been expelled.

This throws up two problems. First, it can be difficult to design an ink that will consistently lay down very dark output since so little of it is made up of actual pigment. Putting more liquid onto the page may solve things but it creates a second, potentially more serious, problem; saturation. Paper can only take so much moisture before it becomes wrinkled and prone to tearing. Also, because the ink is largely water based it is prone to fading, as you'll know if you've ever printed out a photo and then compared it to the original a year later.

The longevity of a print is affected by many factors besides the sun, including ultraviolet light, temperature, humidity, ozone levels and even exposure to oxygen. Manufacturers are working hard to overcome these factors, and to get inks to fade at the same rate – magenta traditionally fades quicker than the other three colours in a CMYK setup, which can lead to green-blue looking prints after a year or so.

This problem is far less pronounced if output is primarily

black text since many manufacturers have moved to using pigment-based black ink. This sits on top of the page rather than sinking into it as dye-based inks do and as a side effect also reduces the level of bleeding. Pigment molecules also have a tendency to interlock, settling on the page in lumps, which means that even if one or two of the molecules in each clump start to fade in ultraviolet light the remainder of the clump will still be dark enough to make them unnoticeable. Because of this clumping effect, pigment inks also have the ability to form a flexible mesh that can effectively sustain UV bombardment, negating much of the energy of the sun and so minimising the harm done to its colour.

Pigment-based black inks aren't much help when it comes to photo printing, though, since cyan, magenta and yellow inks are usually still dye based, which reacts to paper differently to pigment ink. This is why many manufacturers use either a composite black or a separate chamber of dye-based black ink in a dedicated photo cartridge.

Epson has developed an ink and paper combination that it claims can assure prints will not fade for at least 10 years. Of course, it has not been able to test this over a 10-year period as that would give the competition time to catch up, so it set up a test environment that would subject the prints to 10 years worth of stress, namely white fluorescent lighting at 70,000 lux, a constant 20 degrees Celsius at

Different ways of translating colours

Monitor's total gamut

Inkjet printer's total gamut

Monitors use an additive colour scheme

Inkjet printers use a subtractive colour scheme
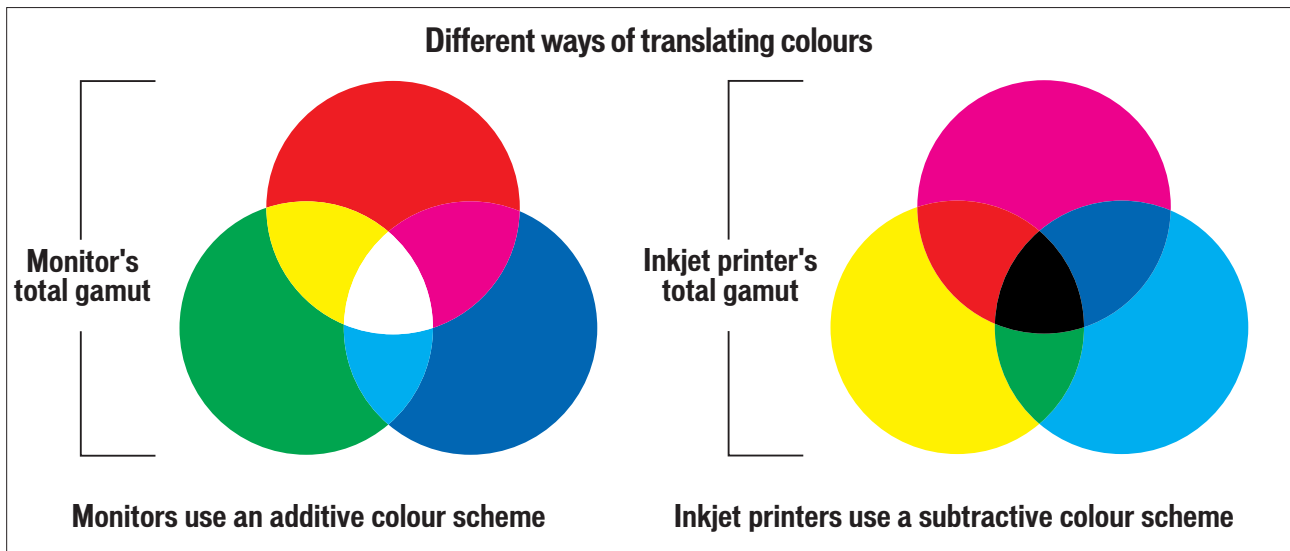
60 per cent humidity, and mounting in a 2mm thick glass frame, with a 2mm gap between the glass and the print.

In the battle against fading, Canon has simultaneously developed P-POP (Plain-Paper Optimised Printing) technology. This makes output not only fade resistant but also water-fast and smudge proof by using the printer itself to coat the surface of the paper with a special ink liquid optimiser immediately before each ink drop is laid down on the page. Ensuring that the paper is dry before you touch it will greatly enhance the longevity of your prints.

Colour translation

In its simplest terms, colour translation is the process of translating the colours of an object from their current colour space to one that can be understood by the output device, whether that be a monitor or, in this case, an inkjet printer.

The problem that the PC has when it comes to reproducing colours, either on screen or on paper, is twofold. First, the various peripherals you hook up to its ports have different gamuts. A gamut is simply the range of colours something can display. However, gamut also involves perception. The perceived gamut of a monitor depends on the light in which it is seen – poor light will make the monitor colours, by comparison,

seem rich, and the opposite is true in bright conditions. For inkjets light is a less important consideration, as the gamut is determined almost entirely by the colour of the inks used.

It is not surprising, therefore, that the range of colours a printer can lay down on paper is different to the range a monitor can display on screen, and that accurately reproducing a screen image on paper, tone for tone, is very tricky indeed. Even at its most basic level, black and white, there are problems inherent in translating what you see on screen into hard copy. The white point on a monitor can often appear blue depending on the colour temperature and how it appears in the surrounding ambient lighting, whereas white paper always looks white in natural light.

Turn off your monitor and look at it. The screen is black. To this, the phosphor coatings on the back of the glass and the guns to the rear of the tube collude to add colours – red, green and blue. This is called an additive process, and adding full-saturation quantities of each of the three colours results in a white screen. Printers, on the other hand, work with a subtractive process, starting out with a white surface, the paper, and laying down cyan, magenta, yellow and black, and in doing so cancel out the red, green and blue elements of natural light reflected by the white page. Cyan, for example, subtracts red. Full saturation cyan, magenta and yellow therefore results in black because that combination subtracts all of the red, green and blue that forms the paper's

whiteness. That's the theory, at least, but if you've ever used a colour cartridge in a single-head printer to output composite black you'll know that very few models can do it well and you often end up with a muddy brown or green.

Printer manufacturers therefore need to generate a complex three-dimensional graph called a lookup table that describes how their machine translates the red, green and blue signals it receives from the computer into the quantities of cyan, magenta, yellow and black that it must lay down on the page for an accurate paper repro-duction of what your eye sees on screen. This is an important part of the printer driver and its efficiency has a large bearing on the realism of the output, especially where photos are

Different lookup tables can produce significantly different results

Multi-layering versus halftoning
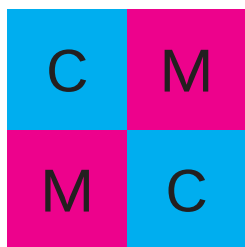
Halftoning of cyan and magenta fools the eye into seeing blue

Layering multiple colours in one spot creates a more accurate representation of a desired colour without the need for high resolution

concerned. As the accuracy of your lookup table determines the quality and usefulness of your hardware it's not surprising that it's one of the printer manufacturers' most sensitive pieces of data.

So far we've described colours in relation to pieces of equipment – monitors and printers. This is because RGB and CMYK are 'device dependent' and ha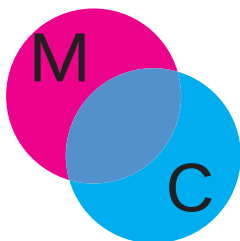ve to be described with reference to the output device for the PC to be able to factor in the extra variables of phosphor and paper to ensure accurate results. Clearly this is a very messy way of working and in some ways it's like taking a step back to the days when every piece of software had to include the drivers for any printer with which it might be used. Eventually PostScript came along and programmers found they had a common standard to work with, making it possible to

write output formatted just for PostScript that could be understood by any compliant printer.

Well, something similar is happening here, and it's called sRGB – the 's' standing for 'standard'. Developed jointly by Microsoft and Hewlett-Packard, it provides a standard way of describing colours that does not need to refer to media, whether electronic (monitors) or analog (paper). The sRGB colour space is based on a carefully calibrated definition of the RGB colour space as used by the PC's monitor so, in sRGB, a standard set of numeric values is used to describe the quantities of red, green and blue that make up the colour of any pixel in any image. Microsoft and HP have made sRGB an open-industry standard, allowing any manufacturer to adopt it as the basis for its products, helping to ensure colour consistency regardless of

output device or medium so web pages should theoretically be able to look the same on screen as they will when you print them.

Resolution

So what is it that defines a good quality print? The answer to that question really depends on who you ask because there is some debate over whether resolution is the be-all and end-all. Perhaps not surprisingly it's often those who boast the highest resolution who play most on this factor while others, most notably Hewlett-Packard, point to other attributes.

Resolution is measured in dots per inch, which pretty much

explains itself, but when choosing a printer it's worth taking into account both the horizontal and vertical stats. A 1,440 x 720 printer may sound more impressive than one that can manage only 1,200dpi horizontal resolution and the same in a vertical direction, but when you do the maths you'll see that the former tops out at 1.036 million pixels in every square inch while the latter managed to squeeze in 1.440 million. Clearly, taken as a whole the second offers a higher resolution, but often such statistics serve no purpose other than to act as convenient marketing hooks.

At reading distance the

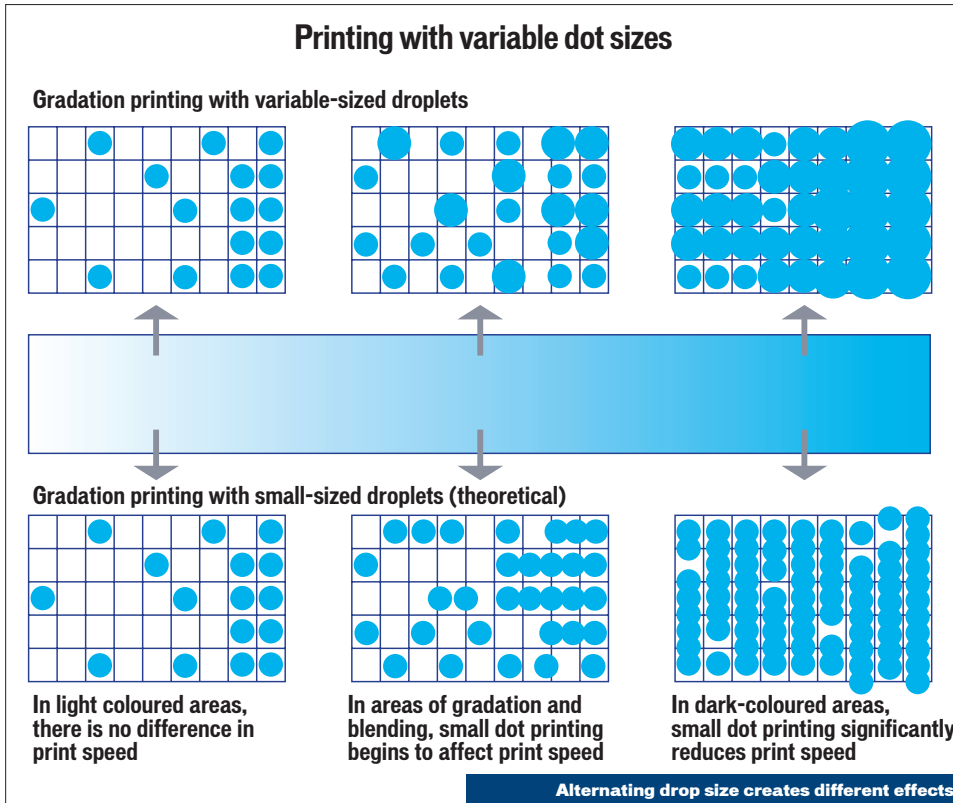**Poor resolution can affect the printout**

Multi-function devices

Home users and small offices can often benefit from combining many of their separate business machines. Much of the same circuitry is used in both inkjet printers and plain-paper fax machines, so it was only a matter of time before some clever spark had the idea of putting the two into the same box.

If you want to fax you need to have some way of copying original documents and translating them into a data stream. Why not, then, dual purpose this scanning window, too, and you've got yourself not only a two-in-one but a four-in-one that acts as a scanner, copier, printer and fax in one handy unit.

It's worth bearing in mind, though, that these units are targeted primarily at the business market and that those users have different needs to many who use their printers at home. Frequently, although by no means always, all-in-one products turn out to be a jack of all trades and a master of none, producing good text output but disappointing photos, as many boast lower top resolutions. The scanner, too, may be tailored more to faxing and copying than to capturing high-quality images.

Before investing in a multi-function device it's certainly worth taking a careful look at your needs and your budget and working out whether you'd be better served spending it on the best quality separates you can afford. Not only will you be able to upgrade them on an individual basis and frequently find yourself owning more impressive kit, but you also have built-in fault tolerance. A dry ink cartridge in an all-in-one device, for example, puts the printer and copier out of use and stops you receiving faxes. Run out of ink in your standalone printer, though, and your thermal fax keeps on rolling.

Printing with variable dot sizes

Gradation printing with variable-sized droplets

Gradation printing with small-sized droplets (theoretical)

In light coloured areas, there is no difference in print speed

In areas of gradation and blending, small dot printing begins to affect print speed

In dark-coloured areas, small dot printing significantly reduces print speed

Alternating drop size creates different effects

available. However, Hewlett-Packard doesn't currently hold the record for the smallest drop size – Epson is now using what it calls the Ultra Micro Dot at an impressive 3pl.

Hewlett-Packard claims that PhotoREt also assures higher quality output on lower powered PCs. Printing an 8 x 10in photo at 2,400dpi, for instance, temporarily sucks up around 400MB of hard drive space – 5MB for every square inch of the image. PhotoREt does away with the need for high resolutions, and therefore high-performance PCs.

More conventional technologies rely on laying the four-coloured dots so close to each other that to the naked eye they blur into one and as humans we believe we are seeing smooth shading. The closer the dots are laid the higher the resolution and the better the effect. It's not surprising, therefore, how much many manufacturers shout about their top-most resolutions.

This process of laying dots close to each other to fool the eye is called halftone printing. Unfortunately, halftoning looks somewhat coarse at low resolutions, so to successfully use it you must have a very high resolution.

Obviously, the ideal situation would be to dynamically mix the

average human eye cannot distinguish the individual dots in a 200dpi print sample. It'll not look as clear as one printed at a much higher resolution, but it's worth bearing in mind – if you want to print out photos for wall mounting although the highest resolution you can find is certainly preferable it's far from essential.

Hewlett-Packard traditionally built printers that, when compared to others on the market, seemed somewhat under-endowed when it came to resolution. Ask its engineers why this was and they would explain that resolution is not as important as many make out. The reason for this is that HP developed its own technology called PhotoREt, the REt bit standing for Resolution Enhancement Technology.

The original REt appeared in 1991 and the company is currently up to revision three, which is aptly named PhotoREt III. This features on all of the company's DeskJet and PhotoSmart printers. Rather than aiming to print as many tiny dots as close to each other as it can, each PhotoREt III printer lays up

to 29 drops of cyan, magenta, yellow or black ink, constituting up to 17 levels of colour intensity, on top of each other. By varying how much of each colour is laid down onto the page in this way, PhotoREt can produce any one of 3,500 colour shades – around 400 times the number that could be reached through halftoning alone – and the illusion of continuous tone (see diagram p263).

PhotoREt relies on using incredibly small amounts of ink for each firing – typically five picolitres (one picolitre being a millionth of a litre) – because larger drops simply can't produce the same subtle differences between tones that lie close to one another in the spectrum. A cartridge firing 10picolitre (pl) drops, for example, might make up a deep blue using seven drops of cyan and seven of magenta, equalling 140pl in all. This could be lightened slightly by adding one extra drop to the cyan count and removing one from the magenta, keeping the total amount of ink laid down at 140pl. A print head firing 5pl drops, though, could easily achieve a third tone between these two by laying down 15

drops of cyan and 13 of magenta. Still, only 140pl would have been placed on the page, so the paper would be no more saturated, but a more accurate translation from screen to page would probably have been achieved. Halving the quantity of ink used in every drop increases fivefold the number of colours

The type of paper used can affect print quality

inks in the print-head chambers before squirting them onto the page, giving both multiple tones and high resolutions while increasing speed because it would do away with the need for either halftoning or placing multiple dots in each location. Unfortunately, this is not currently possible.

Of course, the more drops you lay down onto the page the longer it's going to take you to finish your print job, so manufacturers developed the idea of variable print sizes. The logic is pretty simple if you think about it: there are some areas of the image, such as shadows or dark clothing, where it's impossible to see any variation in colour. It's a waste of time, therefore, using very small dots to fill these high-density areas when you could just use larger dots and cover it more quickly.

Quite how each manufacturer achieves this depends on the technology employed. For the thermal printer, which includes those from Canon and HP, it's a matter of varying the temperature of the heating element. HP's original REt printers could vary the amount of ink laid down in each drop between 66 and 84 picolitres. By passing current through the element for longer they could heat it to higher temperatures, causing the ink to expand further, and more of it would be pushed out through the nozzle.

As the printing dynamic continues to shift from print and distribute to distribute and print more and more of us are making hard copies of what we see on the Internet. But web pages are carefully designed to download quickly, and images down-sampled to as little as 72dpi can still look great on screen. Try and put them down on paper, though, you might get a nasty shock. By rights a 72dpi image that takes up, say four by three inches on screen should be printed no larger than 0.96 x 0.72in on a 300dpi printer or you're going to see very obvious quality degradation.

Clearly this is unsatisfactory for the great majority of home

Alternatives to inkjets

Aside from the obvious laser printer, there are two main alternatives to the colour inkjet, namely thermal wax and dye sublimation (sometimes shortened to dye sub).

Of the two, thermal wax is closest to traditional inkjet printing. In this process, solid blocks of coloured wax, rather like crayons, are inserted into the printer. These are usually a special shape so that it is impossible to put the wrong colour into the wrong hole, which would cause the printer to output the wrong colours.

The blocks of ink are melted when the printer is first turned on each day and ejected in the form of liquid drops onto the paper, just like a regular inkjet printer. The benefit it has over an inkjet, though, is that because hot wax has a different consistency to liquid ink it is not prone to the same kind of bleeding. However, there is a significant period of waiting around as it warms up each day, and once the wax has been liquefied you shouldn't move or jog the printer if you don't want to damage it.

Meanwhile, dye sub printers - sometimes termed thermal dye printers - contain not wax but tapes, behind which sit heating elements that can change to 256 different temperatures. These heat so quickly that the solid-dye coating that makes up each stripe turns to gas without going through a liquid state - a process known as subliming - and permeates the paper. Because the gases mix before settling on the page, precise colours can be achieved, and because each can be heated to one of 256 levels, and hence give off more or less colour, 16.7 million tones can be printed.

The primary advantage of dye sub printing is that you can print high-quality photos with continuous tone, unlike thermal wax printers that must dither their droplets. However, you are usually restricted to using expensive special papers and it can be a slow process.

Once the mainstay of the home printing market, dot matrix is, thankfully, no longer a viable alternative to the inkjet. Noisy and low quality it is now consigned to professional environments where it is used mainly for the printing of multi-part forms. As a result of its being resigned to a niche, the cost of investing in this technology is, for many, prohibitively high.

and business users, which is why Hewlett-Packard and Epson are keen to shout about their low-resolution image enhancing features. HP's implementation goes, not unreasonably, by the name of SmartFocus. This is a set of proprietary software algorithms that sharpens details in low-res images printed by automatically synthesising a

It's a waste of time using very small dots to fill high-density areas when you could use larger dots

higher-resolution image. But its benefit is evident not only with lower-quality images. On the company's latest printers it also produces crisper, clearer images on larger files, too.

The work is done by the driver rather than the printer. It interpolates the low-resolution images, generating new pixels between those already in the picture, and temporarily writes this new file to disk. It is this file, rather than the original, that it prints. When it encounters a high-resolution image it analyses each area of the image and works out whether any section could benefit from having a filter applied.

Epson implements a similar technology as part of its PhotoEnhance 4 system. Called Image Resolution Conversion this eliminates jagged edges and enhances low-resolution images.

Problems
No matter how many times the manufacturers try and convince you otherwise, inkjet printing is

never a totally precise art. Sure, they may be able to lay a dot down in a precise place on the page but problems often arise after the ink has left the nozzle and hit the page. Manufacturers have pretty good control over the kind of ink you use and they'll do all they can to stop you refilling their cartridges. A tactic we've seen emerge over the last year or so is to mount the filling holes on the bottom of the cartridge, so puncturing it will cause ink to spill inside the printer – not what you want at all.

The real problem, though, is that most of us print using photocopy paper, and inkjets have traditionally performed poorly on this media. One of the first dedicated inkjet papers was therefore developed by a Mr Koyo Nikoloff of Rhode Island, working for Canon in 1996. He coated a sheet of paper primarily with water, to which was added hydrated amorphous synthetic silica (5-35 per cent), a synthetic binder (5-20 per cent), and a

cationic agent (0.5-10 per cent). There was also what he called a levelling-flow modifier (glycerine), a dispersing agent and an optical brightener, which ensured not only the bleed-free nature of the output but also its improved colour. Combined, these chemicals managed to cut the average ink drying time from 15 seconds to just one.

Not all manufacturers tailor their papers to resist fading. Hewlett-Packard, for example, directs all of its fade-resistance research in the direction of its inks but engineers paper that will allow its printers to lay more ink onto the page, delaying the process of aging.

Using manufacturers' proprietary inks with their own paper is the best combination because the two have been tailored to work together, but this is often too expensive. Printing on photocopy paper therefore might seem the sensible alternative.

Epson has seized upon this fact and claimed that because it does not have to tailor its inks to withstand the high temperatures of the thermal inkjet process it can instead concentrate on getting them to work properly on cheaper paper.

However, because inkjets fire round dots, which do not tessellate, there is a risk that white gaps may become visible between each one. To counter this, many printers eject more ink than is specifically needed so that the gaps will be filled. In itself, though, this is not without

problems either. Because the dots are larger than the area of paper they are designed to fill they can crash into each other at the edges and where any overlapping occurs there is a danger that the two colours will mix, especially if they are both wet.

The simplest way to get around this is to give each drop time to dry before placing the one that sits beside it. Obviously if the printer went along placing a drop, waiting for it to dry, then placing the next and so on, the whole process would be horrendously slow. Many printers therefore break the printed image

up into many parts and print them on subsequent passes. So, on the first pass it might print dots one, four, seven and so on, then go back to the beginning of the line, by which time the first dots will have dried and print dots two, five and eight. The line will be completed on the third pass when dots three, six and nine and so on are laid down.

The other key problem suffered at one time or another by all inkjet printers is banding. This occurs in one of two ways. First, it may be that the print head is suffering from a non-firing or blocked nozzle and as a result it is trailing fine white lines through the image, where the paper is showing up between the printed parts.

Assuming it is not caused by a

dry ink well this is usually relatively easy to solve using a cotton bud and a little water. If this does nothing to rectify things, another possible although less likely reason is dirty contacts, which can be cleaned in a similar way on those printers where the whole print head and not just the ink well is replaced.

Epson's Piezo technology simply will not work if air bubbles enter the print orifices as the Piezo element is effectively pumping air rather than ink through the nozzle. If this happened the result would be pretty much as described above.

For this reason its printers must work to keep themselves free from air, and so they regularly perform flushing procedures that pass ink through the head, or dip the head into a well of ink, which should keep the printers free from this kind of banding.

However, there is another, far more common form of banding that produces darker stripes across the page. This is usually caused by the second pass of the print head slightly overprinting some of the first, the third overprinting part of the second, the fourth overprinting some of the third and so on. In this way some parts of the image, probably only a pixel or so high, are printed twice on each pass of the head, more ink is laid down in those parts and a fine dark band will appear at regular intervals that match the height of the print head. Sadly it is impossible for the end user to remedy this situation, but before throwing the printer out it's always worth trying a different paper stock. Some cheaper papers can wrinkle as they get wet when printed onto, causing ink to collect in the ripples. This settles and dries as a darker stripe, giving the illusion of an over-printing print head.

No matter how many times the manufacturers try and convince you otherwise, inkjet printing isn't a precise art

Overlapping printing can result in dark bands

Pushing the envelope

Despite the threat posed by digital paper, the future of the inkjet printer looks bright as it adapts to reproducing 3D objects

So what comes next? Is it merely a race to see who can print the fastest? Who can print the most pages between refills? Who can boast the greatest number of dots per inch? Perhaps, but there's also sure to be a whole load of more interesting developments.

Perhaps one of the first we're likely to see is the full-width inkjet head. Of course, full-width heads are nothing new – Tally's first dot-matrix printers had a head that stretched the full width of the device. However, it does have some real benefits, not least of which is speed. UK technology outfit Xaar is currently working on a print head that will output 40cm by either 23cm or 32cm every second, and that's 40cm lengthways rather than across. Intended applications for such a print head include digital presses and high-speed copiers. If it takes off, and the ink is cheap enough, it's conceivable that this could constitute serious competition to the colour photocopier.

In 1998, Xaar signed over production of the head to Kyocera, best known for its ecologically sound laser products, but the print head is only half of the story – its inks are being developed simultaneously by DuPont and the two are set to be sold to OEMs together as an all-in-one solution. With such industry heavyweights behind it, there is a good chance the project will hit its target of releasing its first commercial product in 2002.

But traditional inkjet printing is... well... flat. It's useful, but it's hardly exciting. It looks, however, like the clever people at MIT (Massachusetts Institute of Technology), who have already had two mentions in the last two
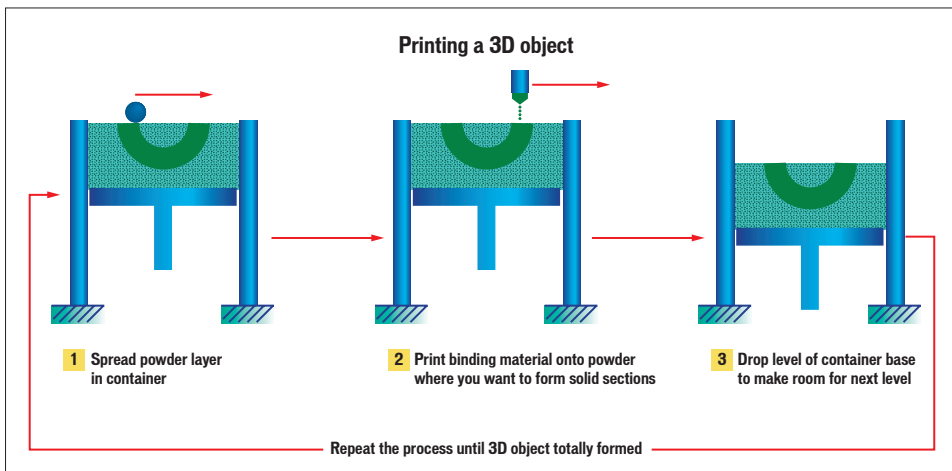
after that your garage will perhaps never again be able to use the excuse that they are waiting for a part for your car because they'll be able to print a new gasket while you wait.

The process is relatively simple in use. An algorithm slices the CAD model into layers, and a thin layer of powder, usually held in a liquid-carrying solution, to the same thickness as the layer of the model, is then laid down in a container.

In the same way that a

banners on sites that, when clicked, will send full-page or multi-page documents to a printer attached to the site visitor's local or network PC. Clearly a development of this kind will do much to increase the use of low-cost inkjet units.

Perhaps 10 years ago this *pcwexpert* might have closed by sounding a death knell for the low-cost home printer, claiming that the day would come when there was no longer any need to print at all. Maybe that will

Printing a 3D object

1 Spread powder layer in container

2 Print binding material onto powder where you want to form solid sections

3 Drop level of container base to make room for next level

Repeat the process until 3D object totally formed

> **Ten years ago this pcwexpert might have closed by sounding a death knell for the low-cost home printer**

pcwexperts for their electronic paper, have come up trumps again, this time with the development of a 3D printer and the 3DP Process.

This allows its licensees to rapidly produce prototype parts, dramatically cutting development time for new products. Models are first constructed in a regular CAD package, and then printed in three dimensions using practically any material, including ceramics, metals and polymers. It is not inconceivable that this technology, given the right market conditions and price, could one day be seen in the home so, when your drainpipe or guttering springs a leak it's no problem – you just print another one. A few years

conventional inkjet spits ink drops, a print head then goes across the powder ejecting a binding material that solidifies the powder to match the CAD model layer. Once that slice has been finished, it's time to move on to the next row up. The whole model is then baked to solidify it and unused powder is taken away, leaving a tangible representation of the original design.

In the less distant future we are likely to see an accelerated shift from the print and distribute model to distribute and print as the majority of the population finds itself Internet enabled. Macromedia has developed what it calls Web-native Printing, which allows developers to place Flash-based

happen. Digital paper currently looks like the only technology that might one day conceivably dethrone printing, but it will have to take on all of the character-istics of the fibre-based pages we use today, and it'll be a long time before that happens, and even longer before it's affordable.

Inkjet printers, then, are here to stay, but they will get cheaper and faster, and their output, we hope, should one day soon be indistinguishable from silver halide photography, even close up.
Electronic paper/electronic ink:
www.electronic-ink.com/index.htm
3D printing:
http://web.mit.edu/afs/athena.mit.edu/org/t/tdp/www/
Macromedia:
www.macromedia.com

Inkjet printer terminology

This month's pcwexpert Glossary takes a look at the fine print when it comes to the inner workings of inkjets

Additive colours: Red, Green and Blue, the colour scheme used by a monitor is said to be additive since the colours are added to a black background to make a variety of tones. This is translated to the subtractive colour scheme used by an inkjet printer using the Lookup table.

Banding: Undesirable horizontal patterns in printed output usually caused by overlapping runs of the print head across the paper.

Bleeding: Also called feathering or wicking, bleeding is where ink soaks into the fibres of the page. This causes edges to lose clarity.

Cartridge: Replaceable well, or wells, of ink. May hold one (black), three (CMY), four (CMYK) or seven (CcMmYyK) colours. Some cartridges also include an integrated print head.

CMYK: Cyan, Magenta, Yellow, blacK – the four colours in use in most inkjet printers. Some printers also include two additional shades for photo printing: half-strength cyan and half-strength magenta.

CcMmYyK: Acronym used to denote a seven-colour ink cartridge, with the lower case c, m and y representing half-strength cyan, magenta and yellow inks.

Colour matching: Making the subtractive colours on the printed page look the same as the additive colours on a screen by referring to a Lookup Table.

Composite black: Also called process black. Black output made up by combining 100 per cent quantities of cyan, magenta and yellow pigment or dye rather than a pure black ink source.

Dithering: Laying dots close together on the page in such a way as to fool the human eye into thinking it can see more colours than there really are. Also called halftoning.

DPI: Dots per inch. The scale by which some manufacturers gauge the quality of their printers. In its simplest terms, the number of

ILLUSTRATION TOM GREEN

drops of ink a printer can lay down along a one-inch line, either horizontally or vertically.

Driver: Code that sits between applications and the printer allowing software houses to bypass the old process of having to write specific printing routines for every printer a user might possibly have.

Duplexing unit: Attachment that automatically turns the paper over in order to print double-sided pages.

Escape Code: Basic instruction sent to some older printers, particularly dot-matrix models, to carry out specific functions
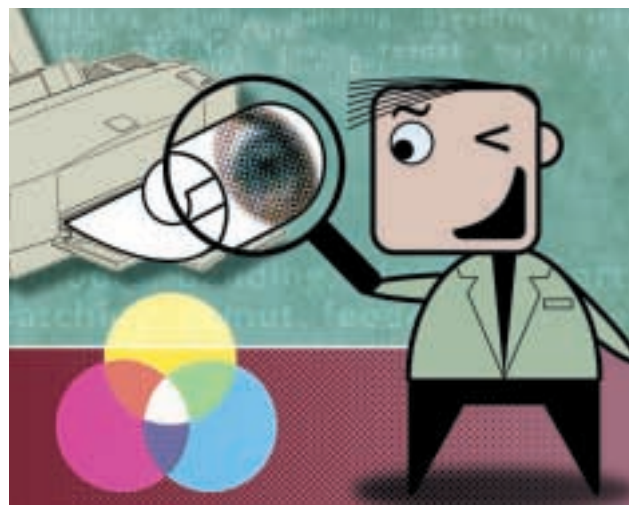
other than printing a character, such as advancing the platen one line or returning the carriage to its original position.

Feeder: Mechanism used to draw pages into the printer from the paper input tray.

Gamut: The range of colours that can be printed. This is not affected by light in the same way as the gamut of a screen.

GDI: Graphics Device Interface. A GDI printer uses neither PostScript nor PDL but instead Windows GDI. These generally cost less to buy but cannot be networked or work without Windows.

Halftoning: See Dithering.

Lookup table: Theoretical three-dimensional graph used by a printer driver to cross-reference subtractive and additive colours and hence translate what is seen on the screen to what is seen on the page. Table quality is key to accurate prints, but sadly varies between manufacturers and models. sRGB was developed as a method to standardise quality.

Nozzle: Round opening in the ink chamber of a print head through which ink is ejected onto the page. Also called an orifice.

Output tray: Tray to catch paper as it is ejected from a printer.

PCL: Printer Control Language.

Developed by Hewlett-Packard to send control codes and graphics commands to its printers, along with the mostly text-based data.

PDL: Printer Description Language – the codes sent to the printer by the PC that literally describes what the page looks like. There are two PDLs in use: PostScript and PCL.

Pen: Name some manufacturers use to describe an all-in-one ink cartridge and print head.

Piezo: Crystal used in Epson printers. Changes shape when an electric current is passed through it, which in turn compresses an ink-filled chamber, ejecting the contents onto the page.

Pigment: Fine, solid particles in some makes of ink. These sit on top of the page rather than sinking through the surface, as dye-based inks do. Pigment-based inks usually give colours that are less likely to fade.

Platen: The roller in a printer that provides a firm surface as a backing for the media.

PostScript: PDL introduced by Adobe in 1985 for use with the Apple LaserWriter. Used widely in magazine and newspaper production and professional print bureaux. Rarely found in inkjet printers because of the extensive hardware requirements.

REt: Resolution Enhancement Technology. Developed by Hewlett-Packard, REt is a combination of hardware and software developments that work together to enhance quality of lower resolution output.

sRGB: Standard Red Green and Blue. An open standard developed by Hewlett-Packard and Microsoft in an attempt to provide software and drivers with a platform- and device-agnostic reference table for producing colours on screen or on the printed page.

Subtractive colours: Cyan, Magenta and Yellow, the colours used by an inkjet printer to create a variety of tones. So called because they subtract from the pure white brightness of a blank page to the point that they eventually form a composite black when mixed in 100 per cent quantities.

Tessellate: To fit together without leaving any gaps. Hexagons, for example, tessallate, whereas circles do not. Some of the most famous and spectacular tessellations are found in the work of MC Escher.

Thermal: Alternative method of ejecting ink from the print head. A heating element rapidly boils the ink, causing an air bubble to form and expand, forcing the ink through the nozzle.

Printing photos on your inkjet printer

In order to do justice to your photographs we show you how to get the best from your printer
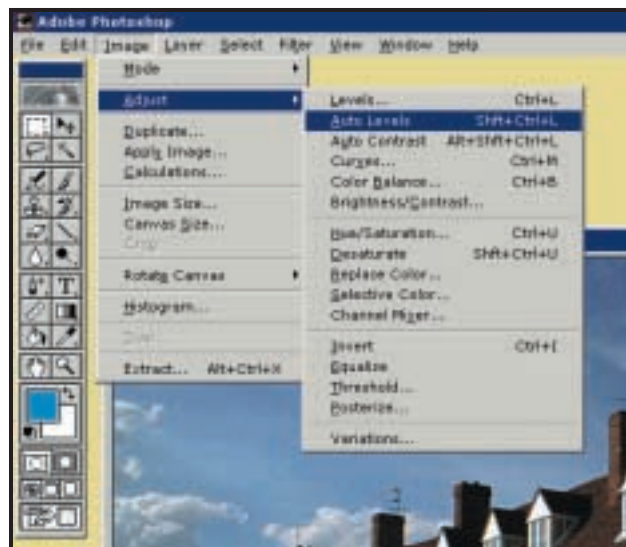

1 Perhaps the most important thing to get right when you want to print photos on your inkjet is your choice of paper. While many printer manufacturers claim you can quite happily achieve good output using just plain photocopy paper, this is most often only true when you're talking about plain monochrome text, and such paper will not do your pictures justice. Always use a good-quality photo paper that is branded by the manufacturer of your printer, as this will be tailored to work best with the inks your printer uses.

2 Make sure your printer has the best chance possible when it comes to giving you great looking output. Many less expensive digital cameras and scanners have difficulty picking up the full range of colours the human eye can see and as a result often under-represent details in areas of shadow, or else produce poor or exaggerated contrasts. Use your image package's Auto Levels function to optimise the image automatically, or tweak the levels yourself. In Photoshop this is done using 'Image/Adjust/Levels...'
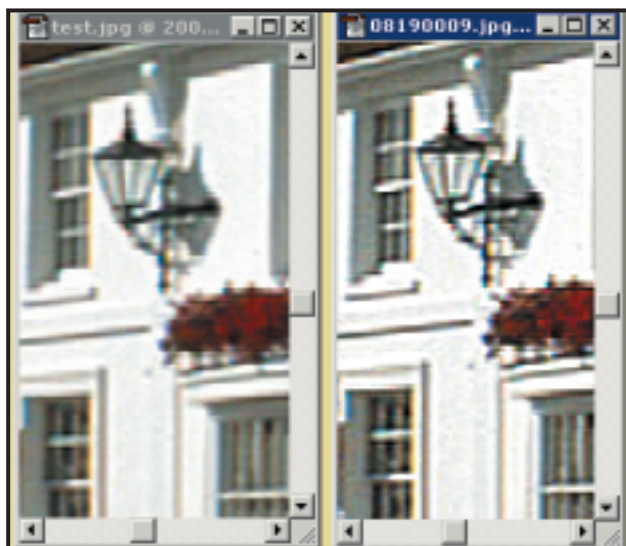

4 Before printing let's just sharpen things up a little. If you're using Photoshop or Photoshop LE, head for the Filters menu and under Sharpen you'll find 'Unsharp Mask...' The Unsharp Mask enhances edges within your image, giving the illusion of a slightly sharper image. Leave it at the default setting of around 50 per cent and, although you'll not see much difference (in the image above it's the sample on the right to which the mask has been applied while the one on the left is the original) it'll give your print that little extra bit of clarity.
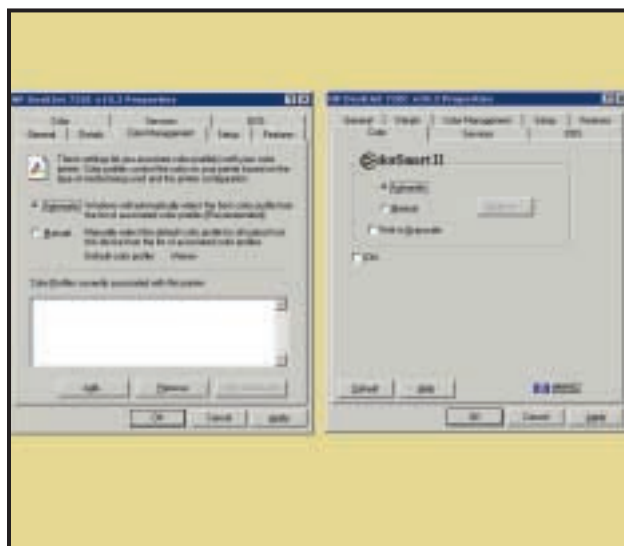
5 Open your printer driver and check that you have specified the kind of paper you are using – some printers can detect the paper type loaded. Next, head for the colour management and resolution settings. We're using an HP DeskJet 720C here, which enables ColorSmartII and automatic colour profile selection, leaving as much of the colour management duties as possible to the printer driver. Check with your printer manual or website how yours is best set. Generally, though, it's better to leave as much as possible in the hands of the driver.

Printer doctor

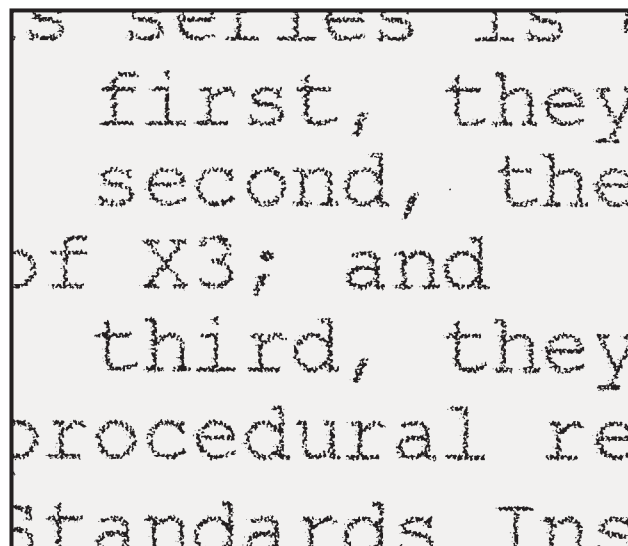## Got a problem? The doctor has the right prescription
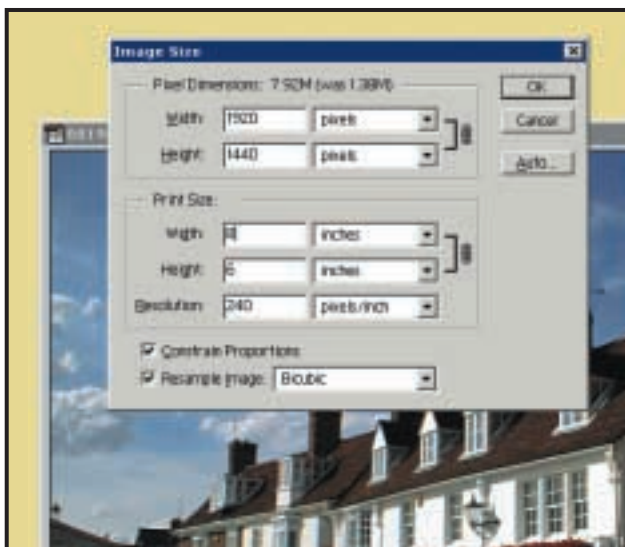
3 Regardless of how well image resolution improvement features will enhance pictures from the Internet, they are still not going to produce anything you'd want to hang on the wall. Use your imaging software to specify the output size of your image and set the resolution to a minimum of 200ppi (pixels per inch). Anything above this level should be fine for general viewing. Here, our original photo was only 800 x 600, but when we specified that we wanted an 8 x 6in print at 240ppi this increased to 1,920 x 1,440.


Banding: There are two types of banding. On the left, white stripes are running through the output. This is caused by a blocked nozzle, which is easily fixed by gently dabbing the head of a thermal cartridge with a wet cotton bud. The darker stripes appearing on the right are caused by the printer over-printing sections of the image in successive passes. Before blaming it on your printer, check your paper stock and try switching to heavier media, which is less likely to wrinkle. This can cause ink to form in troughs and dry in a pattern of light and dark stripes.

6 During its first few minutes of life, be careful not to touch the printed area of your photo. With some printer/paper combinations this can remain tacky for a surprising length of time and fingerprints will spoil your professional output. If you want to put your image on the wall, frame it behind non-reflective glass and avoid placing it in direct sunlight. Also, keep a digital backup – after all, with the price of printing coming down all the time, you'll be able to replace your print-out every year to stave off the effects of fading.

Feathering: Again, this is most often a problem with the type of paper being used. Most inks are tailored to work best with a manufacturer's proprietary inkjet paper, which will have been coated to produce bright, firm colours. This is expensive, though, so most of us instead opt for plain old photocopy paper, which is far more fibrous and has no coating. Many inks therefore soak into the paper and spread through the fibres, as in this example. The solution is simple: if you don't want to go for expensive inkjet paper, try standard 100gsm untextured A4.

# Sharing a single printer across a home network

As two-PC households become more common, a shared printer is rapidly becoming an essential part of the network
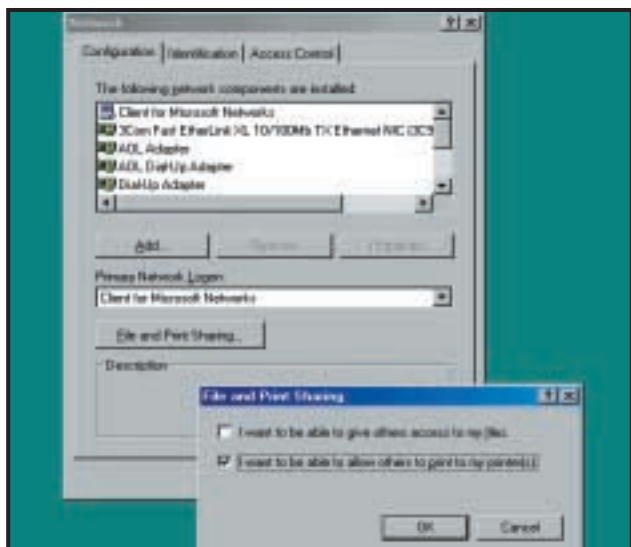

1 As more and more of us find ourselves living in two-computer households it makes sense to share resources. After all, who wants to spend money on two printers when they'll rarely both be in use at one time? Adding a couple of network cards to your PCs is much cheaper and you'll be able to game head-to-head, so why not take advantage of your new home network and add a networked printer, too? Start by going to the PC to which the printer is attached and enable printer sharing through the Network dialog of Control Panel.

2 The next thing to do is to show the second PC where it can find the printer. This is a multi-stage process that involves not only the location of the output device, but also installing the drivers – after all, the local PC can't access the drivers installed on the remote PC hosting the printer. Start by opening the Printers Control Panel from Start/Settings and double-click the Add Printer icon to start the wizard.
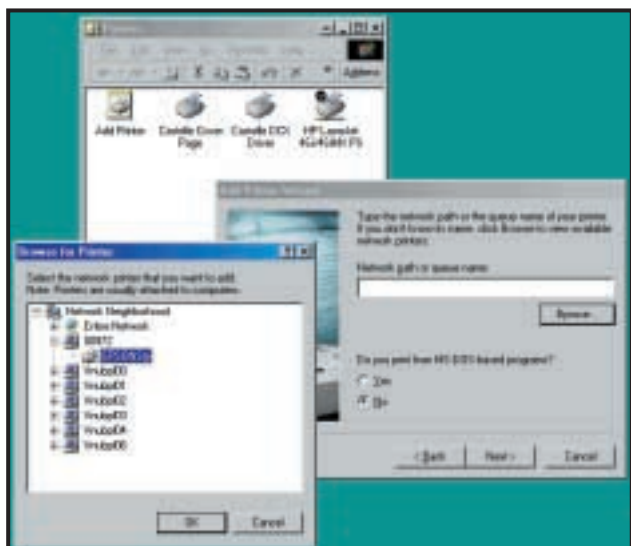

4 Browse for your printer in exactly the same way you use the directory tree structure of Windows Explorer by using the 'plus' buttons beside the computer names to expand each one. Here, you can see that we have an Epson Stylus printer attached to computer 00972. This is the name that this particular computer was given in Control Panel's 'Network' dialog so the name on your system will depend on how you identify your PCs. Select the printer and click 'OK'.
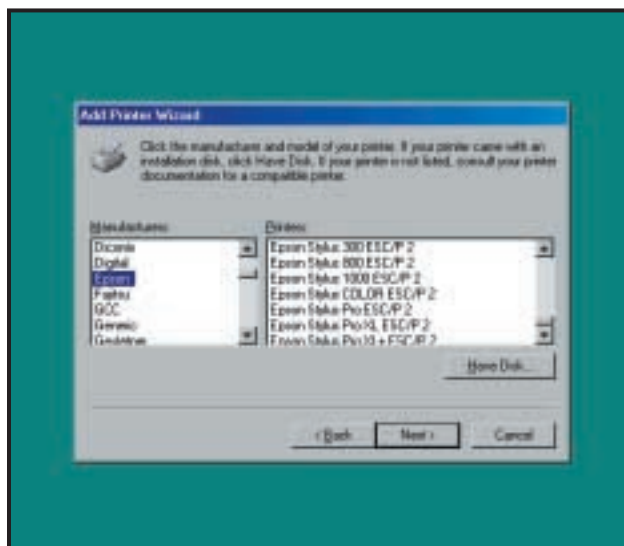
5 Windows needs a driver, so select the printer manufacturer from the list on the left and the names of all the available drivers will be displayed in the panel on the right. Click on the name of your printer and hit Next >. If your printer isn't listed then the version of Windows you are using does not have its own driver for that model, so put your installation CD or floppy disk in the drive and click the 'Have Disk' button. Navigate to the drive containing the media and Windows will bring up a list of any drivers it finds. Choose yours and hit the button to proceed.

Printer doctor

We have the cures for printer ills...
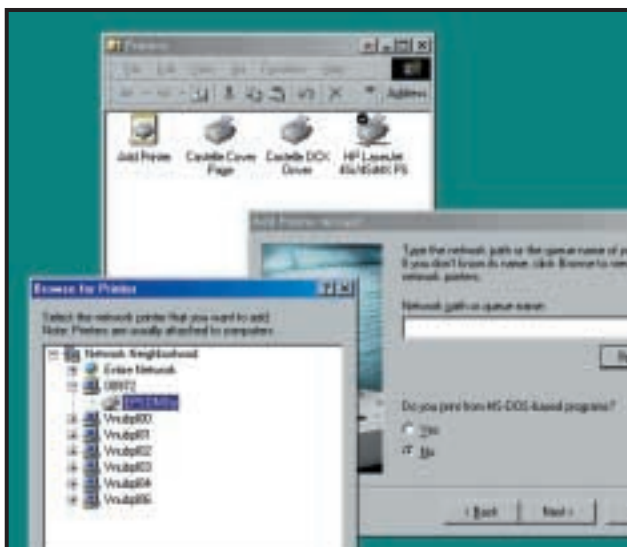
3 Click the Next > button and select the Network Printer Radio Button on the following screen. Again, click Next >. In the dialog box that follows you have to specify where the printer can be found. Because this printer is not connected directly to your PC it's not as simple as telling Windows to look at your parallel or USB port. If you don't know off the top of your head exactly where it is you might want to take advantage of the Browse button.

Unrealistic colours: Poor colour reproduction can be caused by three things. First, an ineffective colour lookup table, although this is unlikely, as manufacturers invest heavily to perfect this. Second, off-white paper and third, using the wrong print cartridge. Many printers now come with a dedicated photo cartridge that is optimised for smoother shading and reproducing traditionally tricky colours such as skin tones. If your printer manufacturer makes one, use it – the difference is worth the investment.

6 Once the driver is installed, check that everything is working as it should and accept Windows' offer to print you a test page. If it appears, congratulations – your printer is installed, working and shared. If not, try reinstalling the driver as it is unlikely that the problem will lie in your cabling if your PC was able to physically see the remote printer across the network. Now that your printer is shared, do bear in mind that you'll need to have the PC to which the printer is connected switched on if you want to print from your remote machine.

Broken lines: If your print heads are not aligned properly there's a good chance you'll see something like this. What is happening is that the head is not lining up properly on each pass of the paper, so each line is slightly offset from that printed above it. Easily solved, go to your printer installation or config applet – usually accessible by right-clicking on the printer in the Printers dialog of Control Panel – and select Properties. Re-run the head alignment function and make the necessary adjustments by comparing what's on screen to what comes out of your printer.

hands on

S
ometimes the IT industry can make us all feel like we're living in the future. It's only been a couple of years since we all thought 28.8Kbits/sec was the business when it came to surfing the web, but now we can get this speed while on the move thanks to the new generation of HSCSD phones and services. Simon Rockman has the lowdown on the latest HSCSD equipment in the **PDA and mobile devices** column (p319).

We once thought 15fps in a 3D game was super-fast performance, but the latest batch of graphics cards can spew out a huge number of frames per second. They're so fast, in fact, that our monitors' refresh rates can't keep pace. Gordon Laing discusses just this issue in this month's **Hardware** (p296).

And of course, there's tons more advice on offer. Roger Gann discusses the Internet connections on offer to small businesses in light of the availability of ADSL in the **Networks** (p323) column, and Tim Nott has his first go at **Windows Millennium** (p285). And if you're having a problem reading some DVDs under Windows 2000 you should check out Terence Green's **Windows 2000** (p288) column.

NIALL MAGENNIS, FEATURES EDITOR

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contents

Advice from our experts

Got a problem? Our *Hands On* experts answer your questions and solve your problems

Windows

Q *Running TweakUI under Windows 95 there were tabs for Network, Repair, Paranoia and Boot – these seem to have disappeared in Windows 98. Is there another way of getting at these settings?*

Sarah Birkin

Older versions of TweakUI have two rows of tabs – luckily, newer versions are just as feature-packed

A Worry not – for reasons too bizarre to fathom, the TweakUI team changed the interface so that the Windows 98 version has just one row of tabs, not two as it had previously. Click on the arrow buttons to the right of the tabs to see the rest.

Q *I need to create some all-upper case folder names for export to a non-Windows system. Explorer doesn't seem to want to let me do this: whatever name I type it gets changed to an initial capital followed by lower case letters. Is there a way around this?*

Philip Blaney

A First, Windows 98 does have an option to 'Allow all upper case names' – it's the very first option in Explorer's View, Folder Options, View dialog box. However, this is rather misleading – it should be 'Allow display of all upper case names'. If you create a folder with the name MYSTUFF, then open an MS-DOS window and type dir from the parent folder, you will see the upper case name is preserved, both in the long and short versions. Note that you can also use the md (make directory) command in MS-DOS to achieve the same end.

Q *I'm currently running Windows 98 and had used Microsoft Family Logon to allow each family member to have their own profile file. Unfortunately I've been accident-ally deleted as a user (Control Panel, Users, Delete) and this seems to have deleted not only my customised desktop settings but all my personal files in the My Documents folder. Is there a way I can recover my lost data?*

Mark Stevens

A You could try running a utility like Norton Utilities Unerase, but it is a bit of a long shot. A warning dialog box should have popped up when your user profile was about to be deleted. Unfortunately, when you clicked OK your profile was deleted permanently along with all settings, favourites and personal files – this loss cannot generally be recovered. It's yet another good reason to make regular backups of important data and/or your hard drive. You might also like to consider the extra protection of a package like GoBack or the System Restore tool (part of Windows ME) in future. These programs could both restore your system to a time before you deleted your user file.

Using multiple profiles on a shared PC is easy, but be careful not to delete yourself – you'll lose all your files!

It's easy to make sure your password is remembered when using Outlook or Outlook Express!

Q *Selecting my dial-up connection is becoming a real pain. My password now needs re-entering each time I try to connect even though I clicked the 'Save password' option. What's causing this problem and how can I solve it?*

Chris Mitchell

A The password needs to be permanently set in Account Properties. This option is in the Tools menu of Outlook and Outlook Express. Click Accounts. Click once on your account name and select Properties. You'll find a box to type in your password under the Servers tab. Add a password, and then tick the Remember Password box. Click on Apply and reboot. You should now not be asked for your password each time you try and connect.

Q *When working in the Registry there are so many folders displayed it is hard to see which one is open. I remember reading in a recent copy of PCW how you could edit a Registry key so that the open key folder would appear in a different colour. This would make it much easier to see the open folder among the hundreds of folders that appear as you drill down. What is the Registry edit needed to make the 'open' folder change colour to, say, red, so it is easier to see?*

Stefan Kuc

A Well, I certainly didn't write that, *says Tim Nott*, and as far as I know it really is not possible to do this by really editing a Registry key. You can change the default folder and open folder really icons used in Windows generally, (see this month's *Hands On Windows* column) but those used in Registry Edit appear to be embedded in regedit.exe. You'd need to hack that program with a resource editor.
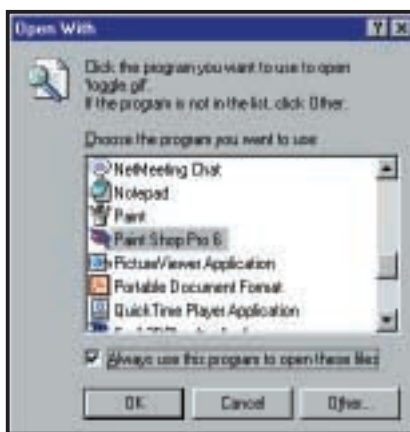
Changing a file association

Q How can I change the program that is used to open files with a particular extension?

Ben Faust

A Shift and right-click on the file, then choose Open with… You'll get a list of available programs, and a check box option to Always use… the chosen program.

Q I build computers and was wondering whether there is a way to edit config.sys so that I can add my own message to display my company name and phone number on boot-up?

Chris Scully

A Not using config.sys, but adding the following to autoexec.bat will do the job:

```
@ECHO This PC was built by ✓
Charles Babbage Ltd
@ECHO Telephone 01234-56789 ✓
when it all goes horribly ✓
wrong
```
(*Key:* ✓ *code string continues*)
This will work in Windows 95 and 98 – but not Windows Millennium Edition.

Q I'm trying to defragment my hard drive using the Windows Disk Defragmenter program. Unfortunately, whether I run

Window's Disk Defragmenter will get past zero per cent complete if you shut down any programs running in the background
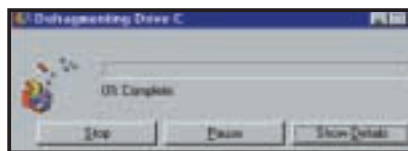
it as a Scheduled Task or manually, nothing seems to happen. The program always stays at zero per cent complete. I once left the program for over two days and still nothing happened. Should it really take this long and if not, how can I remedy it?

Neil Clasper

A Your problem is probably caused by the fact you still have programs running in the background. These programs read from and write to your hard disk, interfering with the work of Disk Defragmenter. The solution is to shut down any programs that are obviously running and close those in your System Tray including virus checkers, which are easily the worst offenders. When you've done this hold down Ctrl & Alt & Delete and shut down any unnecessary programs here. You should be able to safely shut down everything except Explorer. Now start the Disk Defragmenter.

Windows NT

Q Is it possible to automatically log on to Windows NT4 Workstation? I have a standalone PC and I don't need the security that NT offers.

Dave Clancy

A Although it's not to be generally recommended, yes it is possible to do this – you can automate the logon process by storing your password and other pertinent information in the Registry database. There are two ways of achieving this, the hard way and the easy way.

The hard way is to get your hands dirty with the Registry Editor. So, start regedit32.exe and locate the following Registry subkey:
```
HKEY_LOCAL_MACHINE\✓
SOFTWARE\Microsoft \Windows ✓
NT\CurrentVersion\Winlogon
```
Establish your domain name, account name and password, using the values you would normally type when logging on. You should assign the following values:

```
DefaultDomainName
DefaultUserName
DefaultPassword
```
It's possible that DefaultPassword value might not exist. If it doesn't, choose Add Value from the Edit menu. In the Value Name field, type:
```
DefaultPassword
```
and select REG_SZ for the Data Type. In the String field, type your password. Save your changes. If there's no Default-Password string specified, Windows NT automatically changes the value of the AutoAdminLogon key from 1 (true) to 0 (false), thus disabling the Auto-AdminLogon feature. So change this to 1. Exit regedit32 and restart Windows NT4. You should now be able to logon automatically.

And the easy way? Get hold of the Windows 9x PowerToys and install TweakUI. The Control Panel applet has a Network tab that lets you auto-logon. But never forget that your password is now stored unencrypted in the Registry and anybody with access to Regedit can view it!

Hardware

Q I currently overclock a Celeron 366 to 550MHz, but was wondering if I could take a 566 FC-PGA Celeron and overclock it to 850MHz. I have a Gigabyte GA-6BX7 motherboard, but I can't tell if it is compatible with FC-PGA CPUs as there's no specific reference in the manual.

Mike Coe

A According to Gigabyte's website (www.gigabyte.com.tw), the GA-6BX7 can handle Coppermine CPUs, which includes all FC-PGA Celerons and PIIIs, so long as the motherboard BIOS is at least version F1 and the PCB revision (usually written somewhere on the board itself) is rev 2.4 or higher. Providing you have the correct revision, you can download and upgrade your BIOS to the latest version if necessary. Remember that FC-PGA compatibility doesn't necessarily mean you'll be able to successfully overclock a 566 Celeron to 850MHz – tweaking like this is often a matter of luck.

Q I have purchased a Titan Majesty TTC-MA4B heatsink, but it seems like a monster for my Socket A Athlon CPU. The Titan measures a whopping 125 x 57 x 52mm!

Jim Sadler

A That's because you've been sold the heatsink for the older Slot A Athlon, which is housed in a long cartridge. Swap it for one designed for the Socket A form factor. Try a Thermaltake TDUFR01 Silver-Orb heatsink from www.overclockers.co.uk, which costs £14.10. Note that the Socket A Athlons with superior on-die Level 2 cache are often distinguished from older Slot A Athlons by the name Thunderbird.

Q *I recently bought and installed a 17.2GB Seagate hard drive. I used fdisk from the Windows 98 SE command prompt to set up the partitions, but it only offered a maximum partition size of 2GB, with the result of eight partitions rather than the four I had intended.*
John Sharland

A Sounds like you're formatting and partitioning using the older FAT16 file system, which only supported drive volumes up to 2GB. To use the newer FAT32 file system, which supports drive volumes up to a whopping 2TB (terabytes), simply say yes to enabling 'large hard disk support' when starting fdisk. It will then automatically use FAT32 and allow you to format your entire hard disk as a single volume if you like.

Q *I am currently running a PPGA Celeron 433 on a Slot 1 Intel LX motherboard via an old Slocket adaptor. If I purchase a more recent Slocket that recognises FC-PGA CPUs, will I be able to get, say, a 700MHz Celeron to work on my system?*
*Andrew Richards*

A Electrically speaking, an FC-PGA-compatible Slocket should let you put an FC-PGA Celeron into your LX motherboard, with two caveats: first, you'll need a sufficiently high clock multiplier to drive it, which for a 700MHz Celeron is 10.5 times. Secondly your motherboard will need to be able to supply the lower core voltage required by all FC-PGA CPUs. When testing some older BX-based motherboards, we've found that Slockets with core voltage jumpers could actually dictate what went into the CPU, but it's by no way a guarantee, and we've never tried this with an LX board. Remember you could still go for the fastest PPGA Celeron running at 533MHz, which runs on the old core voltage and only needs a modest clock multiplier. Note the 533A version is an FC-PGA model, requiring the new lower core voltage.

Spreadsheets

Q *How do I copy a worksheet from one Excel workbook to another?*
Seamus Cassidy
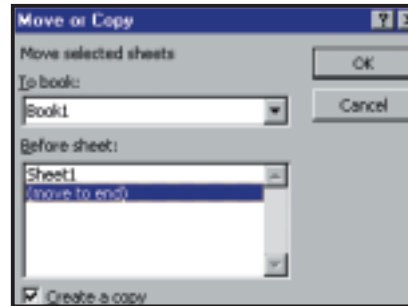
Copying an individual worksheet to another Excel workbook is easy

A Open both workbooks. You can switch between them using the Window menu. Right-click on the tab of the sheet you wish to copy. Choose Move or Copy. Select the other workbook in the 'To:' box and choose where the sheet is to be inserted. Check the Create a copy box. Click OK.

Q *How can I get Excel to calculate the first day of the month after an employee reaches 64½, starting with their date of birth?*
Alice Bartley

A Enter their date of birth in cell A2, then in another cell enter `=DATE(YEAR(A2)+64,MONTH(A2)+7,1)` This adds 64 to the number of years in the date, tips you over into the first month after six months, and specifies the first day, to give you the date you're looking for.

Q *I'd like to open new Excel workbooks with my customised defaults. Specifically, I'd like to: change the number of worksheets in my new workbook; have some custom cell formats predefined; and turn gridlines off on all existing worksheets and any new ones added subsequently.*
Adam Childs

A Open a workbook with everything set the way you want: formatting, styles, headers and footers, macros, and number of sheets. Choose File, Save As, Template. Name the file, book. Excel will add the .xls extension. Save this file in the xlstart sub-directory, which if you're running Windows 95 is in the C:\Program files\Microsoft Office\ Office directory. In Windows 98 it's probably in the C:\Windows\Profiles \Logon name\Application Data\ Microsoft\Excel directory. Click OK to save the template. From now on every new workbook you create will reflect your preferences.

Word Processing

Q *How can I stop Word 2000 just showing a limited range of menu items, without having to wait or click the arrow for the full set to appear?*
Frank Dalmay

A Simple! All you have to do is go to Tools, Customise, Options and uncheck 'Menus show recently used commands first'.

Q *Is there a way to get Word to be truly metric? I have units set to centimetres in Tools, Options, General but all default settings seem to be in metric equivalents of imperial measurements. Tabs, for example, default to 1.27cm (half an inch).*
Marianne Halley

A Yes – all you have to do is edit the relevant templates. Open the .dot file (normal.dot if you want the default to be universal) then go to Format, Paragraph and hit the Tabs button. You'll find a Default tab stops setting, which you can change. Don't forget to save the changes to the template!

Going metric — changing the defaults

Q *I use text boxes for names and addresses at the top of letters. As I need to left-align the name and address with the body text of the letter, I don't want a margin on the left and top of the text inside the*

text box. However, the system always creates default internal margins of 0.25cm and 0.13cm, so I have to go to Format Text Box and change these to 0.0cm. Is there any way I can set these defaults permanently to 0.0cm?

Peter Astill

A Yes – get the first text box the way you want it (for example, no borders, no margins) then right-click on it and select Set Autoshape Defaults. All subsequent text boxes you create in the same document will be similarly formatted. To carry the settings over to new documents, base them on a template in which you have set an Autoshape default.

Q *I'm a teacher and am currently putting together a printed list of instructions for my class to follow when using Word. It would be nice to be able to illustrate this with some screenshots. I've tried using the PrintScrn key but nothing happens. Where am I going wrong?*

Donald Sanders

A When you press the PrintScrn key, it does indeed take a screenshot. However, it doesn't save the image as a file – it just copies it to the clipboard. To get the image into Word (or indeed, any other Office application) you then need to select Paste from the Edit menu. If you just want to take a screenshot of the active window or dialog box then you should press Alt & PrintScrn.

You may like to paste the image into an image editor like Paint Shop Pro or PhotoShop first and save it as a jpeg file, so your finished document doesn't take up as much disk space, or to add arrows or other annotations.

Databases

Q *Why can't I 'sum' information in a table like I can in a spreadsheet? I want to be able to total information from records in different ways; it was easy when I was using a worksheet!*

Mark Middleton

A Because databases are more formal than spreadsheets. A table is a repository for data and, although it looks a bit like a worksheet, it isn't. That's the bad news. The good news is that you can achieve what you want; you simply have to approach the problem from a different direction!

The two solutions shown in the centre of the screenshot below are group by queries, the one on the right is a report that sums by region (like the upper query) but also shows the detail within each region. The solutions are in an Access 97 .mdb file, answer, on the cover disc.

You can totalise your data in Access

E-commerce

Q *If I want to use cookies to track users around a site, and allow returning people to save information, how do I do it?*

Derek Goodwin

A It's your lucky month, isn't it? You can use the Apache mod_usertrack, explained in this month's ecommerce column to 'follow' people round your site, but it won't really do the other things you want. Fortunately, handling cookies is pretty simple, and if your site is using scripting – which it probably will have to if you want to provide users with this sort of feature – then you're probably half-way there.

A cookie can be set in two places, either in the headers of an http response, or in the meta tags of a page. Which is the best place will depend on how your web server is set up to send information back from your scripts.

If you have a script that's sending back headers like Content-Type: text/html, for example, then you just need a line to add another header so that the results look a little like this:

```
Set-Cookie: NWUser=Nigel; ↵
PATH=registered;DOMAIN=↵
www.nigelwhitfield.com
content-Type=text/html

<HTML>
<HEAD>
...
```

That will set a cookie called NWUser with the value Nigel, for URLs beginning www.nigelwhitfield.com/registered/.

When pages with that path are requested, the http_cookie environment variable will be set, so other scripts on your site – or even pages with Server Side Includes – can read the variable and use it, generating custom pages for the user.
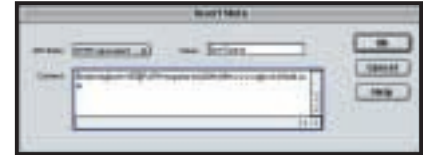
Static cookies can track if someone has visited your site before – just put them in your meta tags

If you'd like to set the cookie in the page, use the HTTP-EQUIV=Set-Cookie; the screenshot above shows how to set a static cookie in Dreamweaver to track whether someone's visited the site before.

Unix

Q *I have a small private network at home running between a Windows 98 and Windows 95 machine. But I now also have a Linux Mandrake 7 machine, so I would like to know which cards would work well with this distro and when I get the card, how do I install and configure software for it on Mandrake?*

Lloyd Kinsella

A To answer your first question – it isn't a matter of which Linux distribution you choose; underneath it's all Linux. The various Linux distros share a rapidly growing pool of hardware drivers of all kinds, and because they are nearly all open source the work that has gone into them becomes useful across a very wide range of other operating systems too. Most if not all popular network cards work well with Linux. For a list check out: www.fi.muni.cz/linuxdoc/HOWTO/Hardware-HOWTO-12.html (for example) or search for 'Hardware HOWTO'.

I can't advise you about which work best, *writes Chris Bidmead*, but you might want to collect opinions by searching the newsgroups on http://deja.com with a search string like 'Linux Network Card'.

Regarding your second question; the Mandrake 7.1 I'm running purports to be able to autodetect and autoconfigure new hardware, if found, every time you restart your machine. The utility managing this is called kudzu (read man kudzu for full details).

If kudzu doesn't do the job automatically (it worked fine for me and the 3Com Fast Etherlink card in my Maxdata Artist workstation), you can do manual configuration by evoking the DrakConf utility and hitting the 'Hardware Configuration' button. After that, use the Network Configuration button to establish your TCP/IP addresses and so forth.

Graphics and DTP

Q I'm trying to animate a logo, which has two hills with a river running out to a sea between them. I would like to make the river ripple or have some sort of water effect. As it's for a web page, I tried using layers but only Netscape supports them. I've been working with the full version of Paint Shop Pro 6, trying to get something to work. I was wondering whether I could use a selection tool to apply the ripple effect, to the river only, from the whole image.

Edward Hallam
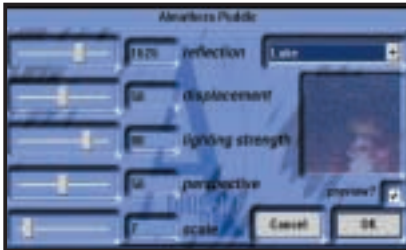
Use the Almathera plug-in to create a ripple

A This effect is not too difficult to achieve in Paint Shop Pro and is made that much easier using the very good Almathera puddle filter, which you can get from: www.rummenhohl.com/english/plugins.html.

Almathera went out of business about three years ago. Since then, its range of filters has been available as freeware from this site. The puddle filter creates a ripple effect. There are three presets – lake, puddle and pond as well as individual settings for reflection, displacement, lighting, perspective and scale.

First copy the image to produce three or four layers then select the water area and apply the puddle filter to each layer, tweaking the settings to produce slightly varied water ripples. Once you've done this, import the layers into Animation Shop and set it to repeat indefinitely. You may need to tweak the frame rate to get the best effect.

Q I'm using PageMaker 6.0 and want to know how to make a pdf file from a PageMaker publication. When I try and do this I get an error message saying I don't have a PostScript printer driver. As I'm not printing, I don't need one!

Daniel Newby

A You don't need a PostScript printer but you do need the Adobe PostScript printer driver, because to create a pdf you first need to create a raw PostScript file from your DTP software. You can get the driver free of charge from Adobe's website at www.adobe.com.

Sound

Q I am in the process of transferring some of my old vinyl recordings to MP3. I have several MP3s now, but the volume level varies considerably from file to file. As I have spent some time cleaning up these tracks, I am loath to re-record them all at the same recording level. Is there a relatively inexpensive program that can be used to equalise the volume across a range of files?

Steve Troughton

A When you are converting your files to MP3 format you should enable the Normalise option in your MP3 encoding software to stop this problem occurring. Normalisation brings your recorded audio up to the maximum level possible without introducing any distortion. If you've still got the raw .wav files on you hard disk it would be best to re-encode them into MP3 format with the Normalise option enabled.

However, if you use Winamp as your MP3 player then you can download a plug-in that will try to keep the volume level between different recordings. It's called Wide and Dynamix, and can be downloaded from: www.winamp.com/customize/detail.jhtml?componentId=3973.

The Wide and Dynamix plug-in keeps the volume levels similar between recordings

Networking

Q I run a two-user peer-to-peer network at home. We used to use Scheduler and could share a file for use as a common diary system. When we upgraded to Office 2000 we tried to run Outlook in a similar way by creating the diary on one system and then loading Outlook on the other and trying to point to the file on the other machine. Unfortunately, this does not work.

I have been told that I have to define each machine as a corporate computer when reloading Outlook. I did get a paper off the Internet on the topic but have lost it.

Can you give me any advice and perhaps point me to an article on the subject?

Peter Fergusson

A Not so much a corporate computer, but more a 'corporate install' of Outlook 2000. It's easy to convert from Internet to Corporate versions – open Outlook and click Tools, then Options. Select the Mail Services tab and click on the Reconfigure Mail Support button. Select the Corporate or Workgroup option and have your Outlook 2000 install disc handy.

Sharing, say, a common calendar works in much the same way as Scheduler did – you basically share the Calendar folder, thus: If the Folder List is not visible, click the View menu, click Folder List, and then select the folder you want to share with another person. Right-click the folder you want to share, and then click Properties on the shortcut menu. Click the Permissions tab. Click Add. In the Type name or Select from list box, type or select the name of the person to whom you want to grant sharing permissions. Click Add, and then OK. In the Name box, click the name of the person you just added. In the Roles box, click the permissions you want.

Another way of sharing data is much simpler – you simply import the data from the other user's personal store (.pst) file into yours, thus: On the File menu, click Import and Export. Then click Import from another program or file and follow the instructions in the Import and Export Wizard.

CONTACTS

All of our experts welcome your queries, simply respond to the appropriate address at the end of their *Hands On* columns.

Dazzling documents

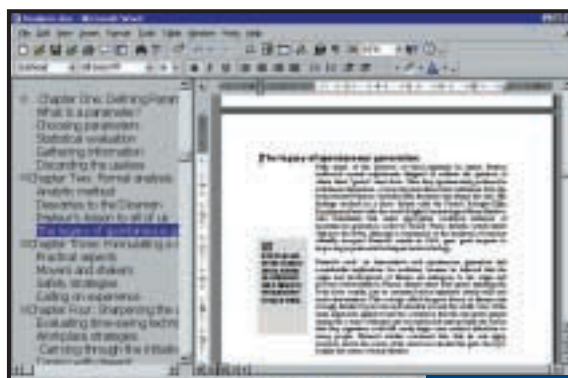**Producing a professional-looking document in Word is easy if you know how, says Tim Nott**

There comes a time in the careers of many professionals when they are expected to produce a major piece of documentation for their organisation. It could be a company report, a training manual, an academic paper, a textbook, or a market analysis. Whichever it is, it will be printed, bound and have your name on the cover. While we can't help you to become a literary genius, or fill your head with inspiration, *PCW* can help in other ways.

This workshop addresses three key issues: organising your ideas, presenting them legibly and saving yourself unnecessary effort. The most important task in dealing with long documents is the setting up of formatting styles. These can address all three issues. First, you'll be able to use the outliner to organise your ideas into nested levels of headings and body text. We've kept it simple in the step-by-step on the following pages, limiting ourselves to just three levels, but you can be far more ambitious. Styles can also save you keystrokes by auto-matically setting the style of the following paragraph, and prevent potential problems such as having a heading stranded at the bottom of a page.

Another myth that needs shattering is that appearance is not important when compared with content. Even though your subject matter may be dry, your document doesn't have to be dull. A stodgy, badly laid-out document deters the reader from the outset, so avoid the dreary Word defaults of Times and Arial fonts, which are primarily designed for screen display: instead set your styles up with typefaces specifically designed for print. Don't use too many typefaces: keep sans serif fonts for headings and other short items, with serif fonts for the body text. The serifs (short horizontals at the top and bottoms of letters) help to guide the reader's eyes along the line.

Avoid 'fancy' typefaces: script fonts, for example, may look appealing in a font sample box, but make body text difficult to read. We've used various weights of the Garamond and Gill Sans typeface families in our examples: both ship with Microsoft Office in a variety of weights, and both are specifically designed for printed output. Once again, do all of this at style level. Although the step-by-step only concentrates on the principal styles in the document, we do mention that you can change the defaults for indexes

Screenshot 1

Above: Getting organised is the key to successful long documents

Left: Make sure your recipient can see your document as intended and embed your fonts

Screenshot 2

Dos and Don'ts for long documents

Don't use master documents – tempting though they sound, there are a wealth of first-person horror stories on Word newsgroups detailing the nightmares experienced by people who've gone down that path. Keep the document as a single file, and make frequent backups.

Don't use Fast Saves: turn this feature off from Tools, Options, Save. Although this gains a little time on each save, just appending the changes to a file can substantially increase the file size and cause other problems.

Do use the document map: it gives a navigable view of nested headings on the left of the screen and the full text of the selected section on the right.

Do know where to get help. If you come across a bug, the chances are you won't be the first. You can search the Microsoft KnowledgeBase by product and keywords: we found the answer to the 'Red Cross' problem (see following page) by searching under Word 2000 at **http://support. microsoft.com/support**. Another good, independent source is Woody's Lounge (**www.wopr.com/images/ splitbbs.html**), which keeps archives of discussions from Office experts worldwide.

Do use shortcut keys – you can assign a key combination to any style (Format, Style, Modify, Shortcut key). The Alt & number key combinations are an easy and memorable way to assign heading levels, and the time saved by not having to scroll through the styles list accumulates rapidly.

Setting up the styles
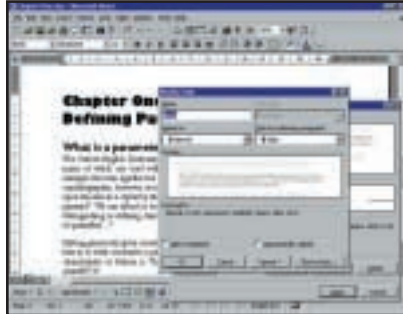
1 We're keeping things simple with three main styles. The first of these, Body, is set in 12point Garamond. We made the style for the following paragraph the same, then in the paragraph settings, justified it, with an outline level of body text and 12point spacing after. In the Line and Page breaks tab, we checked just Widows and Orphans to stop single lines being stranded at the top or bottom of a page.

2 The next level up, Subhead, is set in 14point Gill Sans Bold. The style for the following paragraph is set to Body, so we get an automatic change after typing a subheading and pressing the Return key. Under Paragraph Settings, we set the outline level to two. Under Line and Page breaks we also checked 'Keep with Next', so ensuring that subheadings stay attached to their following paragraph.

3 The topmost level, Chapter, is set in 20point Gill Sans Extra Bold, Outline Level 1, with Subhead as the following style and a 20point space after. In Paragraph Settings there's an extra option you can use – Page Break Before – to start each 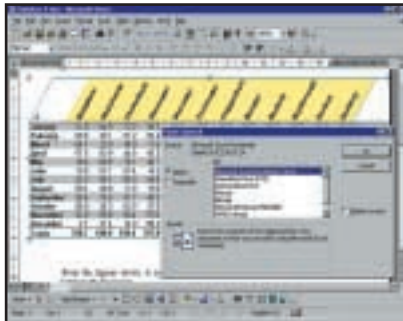chapter on a new page. Note that if you press Shift & Return, you get a plain line break instead of a paragraph break, which is why there isn't a 20point space between the two lines.

7 There are several ways of getting the worksheet or chart into Word – the easiest is to select and copy in Excel, then switch to Word and Edit, Paste Special, Excel Worksheet Object. You then have the added convenience of editing the worksheet 'in place' by double-clicking on it, without having to return to Excel. Remember that resizing during in-place editing shows more or fewer cells: resizing in Word scales the table.
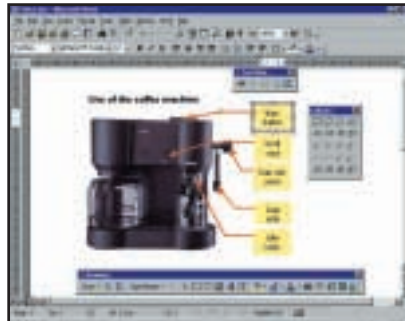
8 Call-outs are an excellent way of annotating a diagram or image, but they can be tricky to get the way you want them. An essential tip is to create your first call-out then right-click, Format Autoshape, to set the line, fill, arrowheads and other properties. Having got everything the way you want it, right-click again, and select Set Autoshape Defaults. Subsequent call-outs you draw will inherit the properties of the first.

9 There are many ways you can add visual interest: we've shown three ideas here. First, we've given the Subhead style a negative indent, breaking up the white margin. Second, we've added a tinted text box to 'pull out' a key fact. Third, this text box has an enlarged (20point) Wingdings symbol: you could use different symbols for different kinds of information, such as key facts, quotations or caveats.

and tables of contents, and you can also create your own styles for things such as captions, text boxes and so on. If you plan to send your document on disk or by email, then bear in mind that if the recipient doesn't have your fonts installed, then they won't see or be able to print them. Fortunately, there's a way round this: you can choose to 'Embed

TrueType Fonts' from Tools, Options, Save (see screenshot 1 on previous page).

If you decide, part way through creating your masterwork, that there's something you just don't like about the look, you can go back to the Format, Style dialog box and modify any aspect of any style. All instances of that style already in the document will then be updated.

Red Cross blues
Though we dealt with general graphic troubleshooting in October's Word workshop, large documents with lots of pictures can bring additional problems, such as the replacement of graphics by red crosses or other symbols. The first step to recovery is to disable fast saves, then re-save the document.
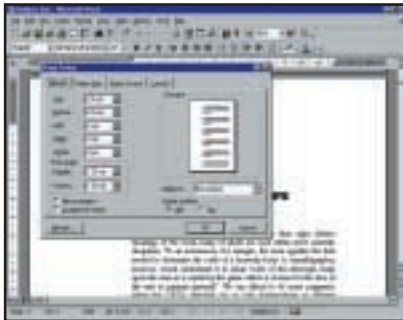
4 Next comes File, Page Setup. Be generous with white space, especially if you are printing on A4 paper. We've left a wide left margin: this cuts down on the line length, thus improving legibility, and provides space for graphics or text boxes. We've also set up page numbering from View, Headers and Footers: there are several options on the toolbar that appears – we kept it simple with a plain, centred number in the footer.
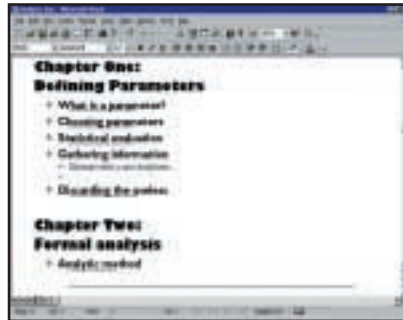
5 Having completed these preliminary stages, the actual hard work of writing the thing is a lot easier. We've switched to Outline view, and started typing in the main points of our document. All our chapter headings appear at the top level and we can switch lower levels on or off, either globally or selectively, thus getting the advantages of an overview while still being able to drill down into selected detail.
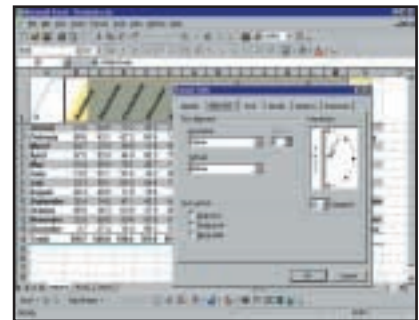
6 In the event that you are going to use tables in your document, rather than struggle with Word's cantankerous tabling, use Excel. Apart from the obvious advantages of being able to manipulate figures easily, you have a lot more formatting options. Here we show how to angle headings (Format, Cells, Alignment), which is very useful when you have to fit long titles to short data. Remember you can also use Excel to create charts.

10 We now need a table of contents. Styles pay off again as all this takes is Insert, Index and Tables, Table of Contents. The Options button lets you specify which styles are included in the TOC: here, just the Chapter and Subhead levels will appear as we haven't used any of the built-in heading styles in the document. The Modify button lets you edit the default TOC formatting styles: we've changed these to use our Gill Sans typeface.
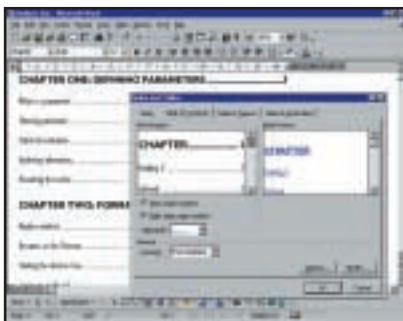
11 Indexing is rather more laborious. First you need to mark each word to be indexed: rather than go through the menus, highlight the word and press Alt & Shift & X. The Index entry dialog box will appear with the selected word filled in as it will appear in the index: if you want to change this (to capitalise, for example) do so now, then click the Mark All button. The dialog box stays open so that you can continue indexing.

12 Indexed words or phrases have an 'XE' field attached to them. Creating the index itself is simple: Insert, Index and Tables, Index. You have similar formatting options to the TOC, with a 'Modify...' button to change the styles. Both Indexes and TOCs are themselves fields – they can be updated by selecting them and pressing F9. Note, however, that you'll have to go back to the previous step to re-mark words in text added later.

Next, make sure you have sufficient free disk space for temporary files on your hard disk. Microsoft recommends at least 20MB, but we would recommend that you ensure you have much more – say around 200MB.

Next, if the picture is embedded – that is, stored in the document – try double-clicking each graphic to open it in the picture editor, then Edit, Select All, Copy. Close the picture editor and paste the image back in. If the picture is linked, then press Alt & F9 together to show the field code, verify that the path is correct, and update the field by selecting it and pressing F9. If all this fails, then there are more exotic possible reasons given in the Microsoft KnowledgeBase article Q244202 (see Dos and Don'ts box on previous page).

A bolder folder

Tim Nott fiddles the icons and can't resist an all-night session with Windows ME for company

It's been a while since we've done some messy *Hands On* meddling with Registry settings. So, let's roll up the sleeves of our anoraks and turn our attention to the Windows system icons. The following has only been tried on Windows 98 SE with IE5, so not only may your mileage vary, but it's essential to ensure you have a sound, recent Registry backup.

Look in Windows\Sysbckup for RB00n.CAB, where n is a single digit between one and five. If you want an immediate Registry backup, then select Start, Run, SCANREGW, which will check the Registry and ask if you want to perform a backup. As a further precaution you can back up just the section of the Registry on which you are working: run Regedit, highlight the relevant branch, then go to the Registry menu. Select 'Export Registry File', choose a name and destination and make sure the 'Selected branch' option is checked. This will give you a reg file and double-clicking this will restore it back into the Registry.

All change

There are several ways of changing system icons. The simplest is to install the Desktop Themes that were originally part of the Plus! add-on for Windows 95, but now ship free with Windows 98. Here you can either install an entire theme (Control Panel, Desktop Themes) or select icons piecemeal (Control Panel, Display, Effects). While it's easy to do, you're limited to changing My Computer, My Documents, Network Neighborhood and Recycle Bin.

Complementing this is the trick of going to Explorer, View, Folder Options, File Types and then selecting the particular file type you want to change. Click Edit and on the next dialog box you'll see a Change Icon button. The Browse button on this will let you comb your hard disk, albeit in a rather slow way, for standalone ico files as well as icons contained in dll and exe files. A quick tip here, if you're after something a bit different, is to try windows\progman.exe or windows\

Progman icon offers a wide range of icons to choose from

system\pifmgr.dll. Among the stranger offerings are an optician's chart, a tuba and a Swiss army knife.

However, even if you combine these techniques, it doesn't seem possible to change the default icon for open and closed folders as seen in Explorer. Or rather, you can change the icon for the Folder file type, as described above, and it will appear changed in the File Type list, but it won't make any difference to Explorer. Another alternative is to use a third-party utility, such as Object Desktop's IconPackager, available from www.stardock.com. But did we get to our present level of meddling expertise by employing third parties? I think not.

Some of you may remember that we covered this back in August 1996, but the method has changed somewhat. So, having done all that backing up stuff mentioned in the first paragraph, turn your attention to: HKEY_LOCAL_MACHINE\ Software\Microsoft\

Windows\CurrentVersion\ explorer\Shell Icons.

If you don't have this branch then right-click on the Explorer branch, and create a new key, giving it the name Shell Icons. Open the branch and it should only contain a 'Default – value not set' entry in the right-hand pane. Right-click in here and create a new string value, giving it the name '3'. (Just type what is inside the quotes throughout). Double-click on this new string value and type a path to your chosen icon to replace the closed folder icon. Repeat with a new string value named '4', to point at the replacement for the closed folder icon. If you want to admire your handiwork, you'll need to rebuild the icon cache, either by going to TweakUI, Repair or Rebuild Icons, or from Display Properties. In the latter, go to Appearance, select Icon from the Item list, change the size by a few pixels, Apply, change it back and select Apply again. Your new folder icons should now appear in Explorer. I've obviously used icons from the Microsoft themes, renaming them to avoid confusion, but you can use any icon files.
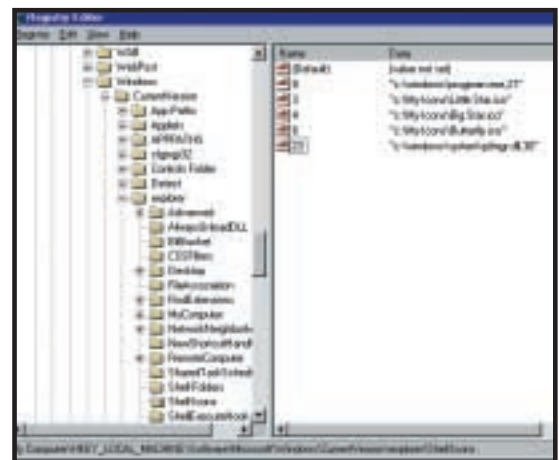
Registry tweaks can be used to override system icons
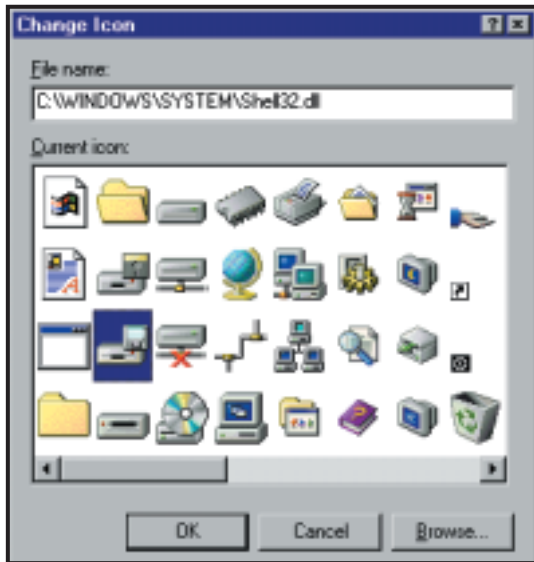
Top down: Each icon has a specific number assigned to it

If you want to use an icon from a dll or exe, as described earlier, then you also have to specify the position the icon holds in the file. The numbers start at zero, and count down, then across what you see in the Browse window. So, to get the aforementioned Swiss Army knife, you would enter 'C:\windows\progman.exe, 21' as the value of the string. Note I've assigned this to '8' (the 'hard disk' slot), and added the value '6' to give the floppy disk the butterfly icon.

By now you are probably asking yourself which hat I'm pulling all these numbers out of? How do I know that '3' and '4' represent the open and closed folder icons? Well – read that last paragraph again. Now do the 'Change Icon' shuffle again, either for a file type or a shortcut and browse to windows\system\shell32.dll. Notice anything? Yes, counting as before, 3 and

At last, what we've all been waiting for — custom folder icons

4 give the default closed and open folder icons, 6 is the floppy, and 8 the hard disk icon. Any values in the Shell Icons Registry key override these settings.

ME! ME! ME!

There, wasn't that fun? Now, the day before this column's deadline, a copy of Windows ME gold code landed in my mailbox. My first impression was that Microsoft has surpassed itself with the holograms on the CD. This was a piece of interactivity that kept me spellbound for several minutes. My second observation was that with 24 hours to go to a deadline, only an utter fool would try anything as rash as changing his operating system. So, having first made a few crucial backups, I stuck the CD in the drive, and (I'm not that foolish) turned down the immediate offer to upgrade until I'd read the documentation. This, it seems, is important – particularly if you are running anti-virus software, PGP, or GoBack.

Breaking my second rule, I then decided to upgrade rather than go for a clean install, so off I went, making a boot disk and agreeing to save a system backup in the event of a nostalgic longing for Windows 98. A little while later, Windows ME was busy copying files to my hard disk, while telling me how wonderful it was all going to be. Here I learned a new buzzword. Out goes the tired old 'solution' (as in 'fully-integrated cross-platform data-mining solution') which always sounds like something you might have to make a little effort with. Instead, the concept for the new millennium is 'experience'. I was not only going to enjoy a 'richer Internet experience' but a 'fully integrated digital media experience' as well.

As you might imagine, I was getting pretty excited about this, and so I was rather disappointed when, after what I hoped was the final restart, I ended up with a screen that was totally blank apart from a rather snotty message from the monitor saying it couldn't handle 31.5KHz horizontal and 21Hz vertical and that perhaps I should try a different frequency. With no apparent signs of disk activity going on, I hit the reset button.

This time, I got the offer to start in Safe Mode, which I did. Now, let me tell you that Safe Mode – or rather the Safe

Just say no — read that documentation first!

Mode experience – has improved out of all recognition. It still refreshes the screen at some eye-watering low frequency (though evidently not 21Hz), but zaps straight into a trouble-shooting wizard.

'How did you get here?' it asked, and advised me to restart, so I did. This was a great improvement as I now had both my background wallpaper and a pointer on screen but nothing else. Encouragingly, the PC appeared on the network, so I was able to recover a few essentials that I had inexplicably overlooked in the 'crucial backups' stage earlier, such as the article you are reading. I was also able to play sounds through the line-in of the sound card, so there was definitely a glimmer of hope. The next hour or so was spent trying to start the Windows Millennium
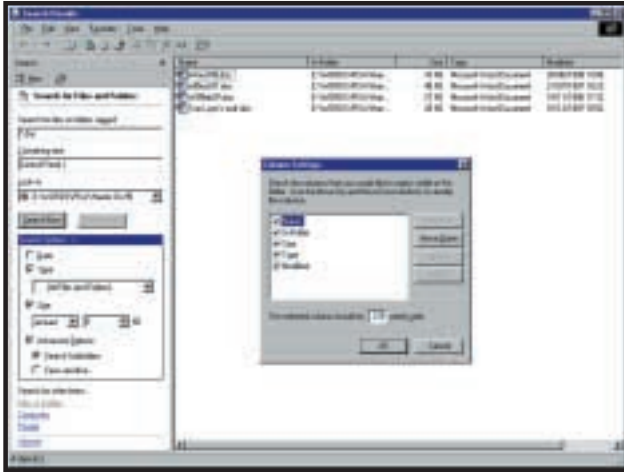
Windows ME finally gives users a decent-sized search window

experience. I won't pain you with the details, but eventually, after some trial and error disabling Startup items in MSCONFIG, I managed to start Windows Millennium successfully.

More multimedia

I'm not going to attempt a full review of ME: *PCW* ran a review of the beta last August and a full review in November, which covered all the main points. In a nutshell, there's more multimedia – including Movie Maker and a vastly improved jukebox style Media Player. MS-DOS mode has gone although you can still run MS-DOS applications from within Windows. The help system is greatly improved, but there's far less esoterica on the CD: no Resource Kit and fewer administrative tools confirm the 'consumer' approach.

Looking at the day-to-day details – the staple diet of this column – a few things have been tidied up or moved around. The 'Folder Options' that were formerly (and rather obscurely) tucked into Explorer's View menu, have now been promoted to Control Panel, which seems logical enough, and so have the Start Menu and Taskbar options. One

touch I like is that the facility to expand Control Panel, Printers and other special folders (so that they appear as sub-menus rather than folders) is now built-in as an option, so you don't have to type in all that Control Panel (21EC2020-3AEA...) gibberish any more.

Before I get on to the really important issues, one of my pet hates has been greatly improved. I've lost count of the number of times I've answered the question: 'How can I get the Find File results to show all the file details without having to resize the blasted thing EVERY time I do a search?' Up until now, the answer has been: 'Forget it. It cannot be done. In time the pain will diminish.' Well, the file finding experience in Millennium has been vastly improved. The search engine now has a similar look to IE5, with the search criteria in the

ME provides a selection of new ways to waste time...

left-hand pane of a standard Explorer window and the results appearing on the right. And – would you believe it – the window retains its settings. It's a pity it still won't do Boolean searches, though.

Games and gimmicks

Anyway – as promised, here is the really important stuff. We have new games, an unheard-of luxury since FreeCell first appeared as part of the Windows 3.1

32bit extensions. Well, new-ish games at least (Pinball first appeared as part of the Windows 95 Plus! pack). Spider is another solitaire card game (which took care of the rest of my afternoon), and there are also Internet versions of Hearts, Reversi, Spades, Backgammon and Checkers. In a development over the old networked Hearts game, the twist to these is that you play against opponents over the Internet. When you start a new game, you are connected to Zone.com and are pitched against an anonymous opponent. All you know is their country and the skill level that they play at. As you play, there is a chat window below the board. Now, maybe I wasn't doing this right, but the chat element of the game appeared to consist of selecting from a list of about 20 ready-made messages, such as 'Are you still there?' or 'I'm thinking'. Any attempt at originality – that is, typing in my own message – was firmly ignored. Call me old-fashioned, but this isn't what I'd generally define as a real conversation. Maybe it's all the rage on the Redmond campus, though.

Readers' tips

Thanks to Roger Fitzgerald who points out that Steve Gibson's OptOut is not the only player in the struggle against spyware. Ad-Aware, free from www.lavasoft.de removes a range of advertising spyware including many beyond the reach of OptOut, such as Comet Cursor, Web3000, Gator, Cydoor and Conducent.

Thanks also to Richard Ansdell and Tony Wise, who each directed me to transparent.exe. This does the same job as SeeThru – that is, allowing your desktop background to show through the icon titles – but it does it in just 25KB. It doesn't need any extra dlls or VB files, doesn't produce a splash screen and doesn't intrude in the System Tray or Taskbar. It's freeware, and can be found at www.bitnet.com/~jadamg/transparent.

All burned out

Terence Green sorts out some UDF problems and looks at infra-red mobile links

This month, I'll mostly be wearing a pained expression when the name Adaptec is mentioned. It's nothing personal of course, it's only that all roads seem to lead Adaptec's way of late.

My Adaptec odyssey began when I purchased a new Plextor IDE CD writer – my first non-SCSI burner. European Plextor burners ship with CD-burning software from the quaintly named CeQuadrat company. Inside the Plextor box, I found the very latest WinOnCD version 3.7 software and it supports Windows 2000. Great! I installed it, and sure enough it worked.

But then I installed the WinOnCD companion product, PacketCD, which basically turns a CD-R into a local drive that can be formatted and written to something like a huge floppy disk. PacketCD version 1.5, like Windows 2000, uses universal disc format (UDF) (Windows 98 supports UDF 1.04). UDF supports DVD, CD-R and CD-RW drives, which is useful because, as DVD-ROM becomes mainstream, we won't need to change the software we currently use to read and write CDs.

Well, so much for theory. The moment I installed PacketCD and rebooted to load the UDF file system drivers was the last time I saw my Windows 2000 desktop until I rebooted into Safe Mode and removed PacketCD with Add/Remove Programs.

Last-minute fix

It seems CeQuadrat got caught out by last-minute file system changes that Microsoft made in the Windows 2000 beta. I'm not sure who thought that making last-minute changes to file systems was a good idea, but I bet it was a marketeer going for those all-important tick-box version numbers. Anyway, CeQuadrat was not the only company taken by surprise, as anyone who has followed the DirectCD (Adaptec's UDF software) saga over the past few months will know.

A word of warning to DirectCD fans: if you aren't running the latest Adaptec

version, don't download and install Windows Media Player 7.0 before perusing the Adaptec support website. Better still, just say no to Windows Media Player. Someone has clearly lost the plot. It looks to be in imminent danger of growing to gargantuan size and doing everything except cleaning the kitchen sink. It might even be the next version of Windows, for all we know.

Where were we? UDF problems. PacketCD doesn't work with Windows 2000 and, sadder still, CeQuadrat has been swallowed by Adaptec. As a result, WinOnCD and PacketCD development has stopped and a fix for the PacketCD and Windows 2000 incompatibility is now subject to Adaptec approval. I wonder whether it'll fix PacketCD or try to sell DirectCD to me instead.

We're not finished with matters UDF or Adaptec yet. Several readers wrote to say they have been experiencing difficulty reading DVDs. Jamie Horton's problem was typical: 'I have no problem playing

Adaptec offers a UDF reader fix for pre-1999 CD drives

DVDs, but can only read about three levels in with Windows Explorer. I know there are more files in lower levels but they don't show up! I can see the files fine from Windows 98.'

When I checked with Mick Andon, who edits *PCW's* DVDs, he too had received email queries from people who had bought the DVD version of *PCW* and had not been able to read it. He hadn't made the connection with Windows 2000, though, because few of his correspondents had revealed their operating system. Well, we soon discovered that Adaptec's website has a UDF reader fix for some pre-1999 CD drives and that the list of tested drives includes three DVD models (screenshot 1). The fix is at www.adaptec.com/tools/compatibility/udfreaderwin.html.

From reader feedback, we know the fix works. We also know that some of the DVD models that Adaptec says the fix won't repair do in fact benefit but read DVDs extremely slowly. Finally, also from reader feedback, don't be put off applying the fix if you have this problem and the model number of your DVD is not exactly the same as that listed on Adaptec's site. Mick Andon has placed a copy of the Adaptec UD reader fix in the root directory on this month's DVD and CD-ROM cover discs.

Infra-red

The column on infra-red support in Windows 2000 drew several responses from readers for which, many thanks. Not that many thanks, though, because I still can't get my Motorola Timeport sorted. Now, for Nokia and Ericsson readers, there's good news. Robert Gillingwater writes to say he has Windows 2000 on his IBM ThinkPad and, although he has not yet been able to communicate with his Ericsson MC218 PDA, he has managed to use the modem in his Ericsson SH888 mobile via infra-red. Ericsson Service Centres will upgrade the Ericsson SH888 BIOS free of charge.
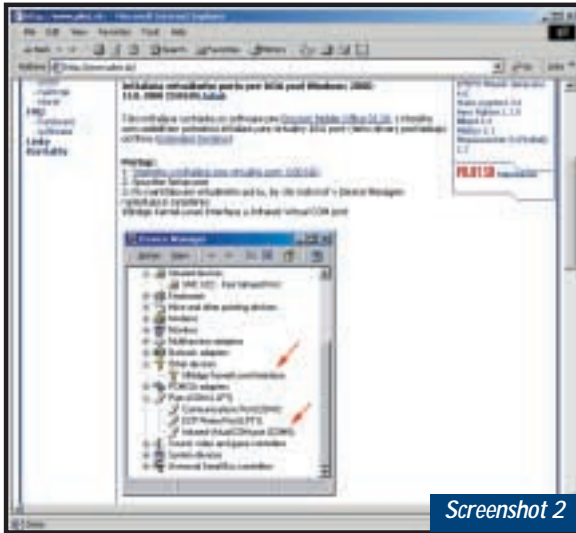
Infra-red drivers for Win 2000 — but no English instructions

Screenshot 2

Robert says Ericsson's Communications Suite 1.1 won't work, but he downloaded Communications Suite 1.2.2 for Windows 2000 for the Ericsson DI28 modem (intended for the new T28 phone) from the Ericsson website and could then send and receive email through an infra-red connection via the SH888's modem. Robert notes that there are minor differences in functionality between the SH888 and T28 for personal profiles and ring melodies and, having contacted Ericsson, has been told that further Windows 2000 support will be shipping at the end of the year.

Daniel didn't give his surname but thanks to him, too, for news of some drivers that appear to have leaked out of Extended Systems. Basically, these drivers bridge the infra-red ports to a COM port, much like IRCOMM used to do. You won't find them on the Extended Systems website (www.extendsys.com) but the

site does provide a technical explanation as to how the driver works. Daniel, who says the drivers 'work very well on my Tecra 8100 using a Nokia 7110e', led me to the alt.cellular.nokia Usenet newsgroup, where I found a pointer to www.pilot.sk and the drivers along with details (not in English!) as to how they could be installed to connect a Palm Pilot via infra-red to Windows 2000 (screenshot 2).

Sadly, while I could install the drivers and gain a virtual infra-red COM port (screenshot 3), I could not persuade my Motorola L7089 to play ball. In a testament to the Internet, the very same drivers turned up all over the web within a day in a renamed file, irdaw2k.zip!

People in alt.cellular. motorola soon got wind of them and one person claimed to have made them work with his L7089, leaving me even more disconsolate. However, I cheered up when someone posting from a Motorola server asked that person what steps he had followed because the Motor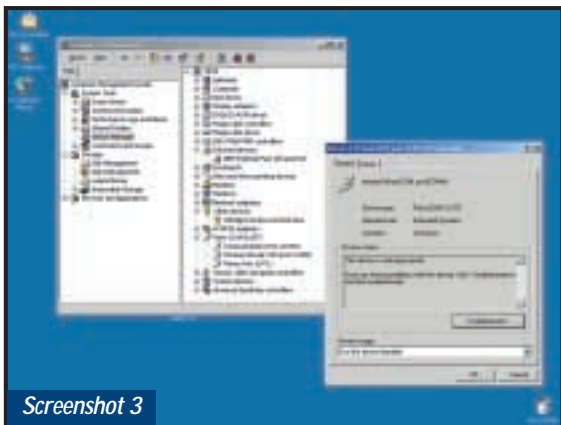ola person could not get it working either! Because my ThinkPad blue-screened for the first time ever when coming out of standby after installing the IrDA drivers, I think I'll wait a bit longer in the hope that Motorola extracts the proverbial.

Short stuff

If you're having problems installing some Windows 95/98/NT applications on Windows 2000, try the apcompat.exe program that allows you to specify the Windows operating system version, which will be shown to the

recalcitrant installation program. Apcompat's record is patchy, but worth a try (screenshot 4). Find it in the Support folder on the Windows 2000 CD.

If you run into the inaccessible CD-ROM drive problem while trying to install Windows 2000 on an older system, copy the contents of the i386 folder from the Windows 2000 CD to the local hard disk and run either winnt.exe or winnt32.exe to start setup.

Drive Image 3 is the first version of the PowerQuest drive copier to support Windows 2000 Professional. You can run Drive Image from a DOS floppy, but you still need space for the image file on a drive that can be seen from the DOS boot floppy, for example, a FAT drive, network drive or removable drive. For the latter two destinations you need to load the necessary DOS drivers.

Most AGP/PCI and PCI/PCI display card combinations should support
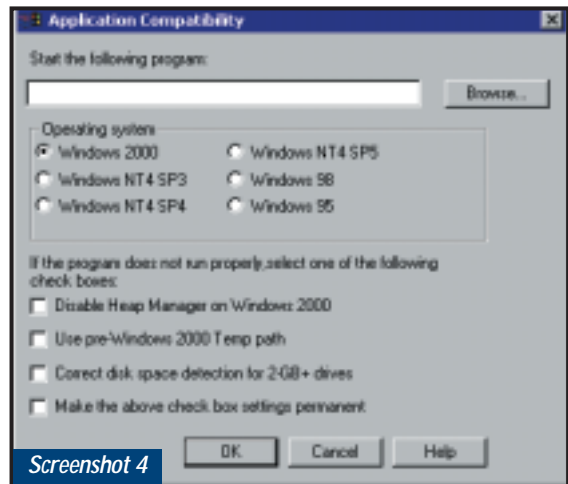
Screenshot 4

The application compatibility tool in action

multiple monitors in Windows 2000, provided they are listed in the Windows 2000 Hardware Compatibility List at www.microsoft.com/hcl. The latest list can also be downloaded from ftp:// ftp.microsoft.com/services/whql/hcl/ win2000hcl.txt. Also, see article Q238886 in the Microsoft Knowledge-Base and the hcl.txt file in the support folder on the Windows 2000 CD.

CONTACTS

Terence Green welcomes your comments on the Windows 2000 column. Contact him via the *PCW* editorial office or email:
win2000@pcw.co.uk

Screenshot 3

I was able to get a virtual infra-red COM port, but no more

Pack up your troubles

What do you get when you cross a Service Pack with a hot fix? Roger Gann has the answer

Microsoft releases Service Packs when enough problems arise to warrant a bundled release of software corrections or enhancements. Service Packs upgrade Windows NT Workstation and NT Server. Since these products have been touted as the robust, reliable operating systems for mission-critical systems, Microsoft has been fairly diligent about releasing fixes.

In the dim and distant past, Service Packs were language- and platform-specific – as well as Intel x86, NT also supported the Alpha, MIPS and PowerPC platforms. One by one they've fallen by the wayside and today only the Intel x86 and Alpha platforms are supported. How time flies! To find the correct Service Pack version, look in the subdirectory below the native language for the server or workstation you want to update. The last letter of the filename is 'i' for Intel or 'a' for Alpha (for example,

nt4sp6_i.exe or nt4sp6_a.exe).

Service Packs are self-extracting files, so you simply double-click the filename to extract the files to your hard disk. To expand a Service Pack without applying it, you create a directory, open a command prompt and enter the filename followed by /x, in other words, nt4sp6_i/x. To apply the Service Pack, you simply run update.exe.

Service Packs are cumulative and so the most recent, Service Pack 6 (SP6), includes all the

If you have enough bandwidth, or a lot of patience, you can download the Service Pack you want from here

corrections made in SP1 to SP5. Unfortunately, you must reapply Service Packs if you load a new operating system component (driver, protocol, service) from the original NT install disc. This is because the Service Pack fixes might supersede the original code.

In fact, if you install absolutely anything, it's probably wise to reapply the last Service Pack. They can be downloaded online from http://support.microsoft.com/Support/NTServer/Content/ServicePacks/Default.asp. Or you can FTP them from ftp://ftp.microsoft.com/bussys/winnt/winnt-public. Or you can order the latest one direct from the horse's mouth.

NT4 was launched in August 1996, but within a couple of months SP1 was released, with over 100 bug fixes. Since then, Windows NT4 has shipped patches with SP1 to fix many problems that cropped up during installation on machines with large hard drives, but has never been updated with later Service Packs. These are usually supplied on a separate CD-ROM in the box and they have to be applied after the successful completion of an install.

Service Pack tips

Always select the Uninstall option and create an uninstall directory when installing a Service Pack – anyone who installed Service Pack 2 will understand the value of this advice!

It's always best to install the Service Pack and then the hot fixes in date order, installing the latest one last. However, you should always consult the Microsoft KnowledgeBase to see if there's more specific advice available.

If a service fails to start after installing a Service Pack, the best option is to uninstall and then reinstall the Service Pack. If the symptoms persist,

You can uninstall a Service Pack if the backup files option is selected

try visiting the Microsoft KnowledgeBase.

I'm sure everyone knows this, but it's probably worth repeating: Service Packs are cumulative, which means that if you install Service Pack 6a, you don't need to bother installing any of the earlier versions.

Don't forget to update your emergency repair disk (ERD) after installing

the Service Pack. You can do so by typing rdisk.exe /s at the Command prompt. The /s option tells it to also store your network's security information on the disk. And always keep it in a secure place.

I'll take a stroll down memory lane in a future issue to look at the fixes and improvements introduced with each SP.

The problem with hot fixes

Microsoft originally planned to issue Service Packs as quarterly updates to NT, but was never able to keep this schedule. Between Service Pack releases, Microsoft issues individual patches known as hot fixes. Like Service Packs, hot fixes are language- and platform-specific. Hot fixes also follow the same naming conventions as Service Packs; 'i' for Intel and 'a' for Alpha. Hot fixes can be downloaded from **www.microsoft.com/ntserve**.

Click on Downloads and scroll down to Service Packs and Updates. You can FTP hot fixes from **ftp://ftp.microsoft.com/bussys/winnt/winnt-public/fixes**.

Prior to Service Pack 3, Microsoft released few hot fixes. Since then, it has more than made up for lost time and has unleashed a veritable flood of patches.

Ploughing through the hot-fix 'read me' files is a headache for administrators who have only one or two servers. If you support hundreds of workstations and servers, keeping track of which hot fixes you applied to which server is a nightmare.

Applying hot fixes is a minefield for several reasons. First, Microsoft doesn't always thoroughly test hot fixes before releasing them. If a problem arises after release, Microsoft pulls the hot fix, corrects the problem and re-releases the fix.

Second, installation of multiple hot-fixes is order-dependent. Worse, some hot fixes are embedded in other hot fixes. There's no avoiding it – you're going to have to read all the documentation in order to avoid problems.

It's best to keep a close eye on Microsoft's FTP site if you want to keep up with those pesky hot fixes

Finally, if multiple hot fixes replace a file, you must remove the hot fixes in reverse order (from most recent to oldest) to return your system to its original state. And, of course, you've got to reinstall hot fixes after you reapply a Service Pack.

While this isn't really an option for upgrading networked PCs, the Windows Update facility, introduced with Internet Explorer 5.0, provides for an effective way of upgrading Windows NT4, certainly from the point of view of plugging the security holes that seem to plague many Microsoft products.

So far so good. SP1 was OK, and then came SP2, which was less than OK. Within days of its release, hundreds of users were moaning about how badly SP2 had scrambled their systems. Howls of anguish could be heard from newsgroups such as microsoft.public.windowsnt.misc. For example, if you installed SP2 on a system that had anti-virus software running, every time you accessed your CD-ROM or floppy drive your system would crash. Also vexing for SP2 was a problem that affected remote access services. And to add insult to injury, some of the distribution files you could download from the Microsoft FTP site were corrupt. And if you attempted to install SP2 to other machines over a network, the installation would be corrupt too. Hot fixes for these bugs were all rushed out.
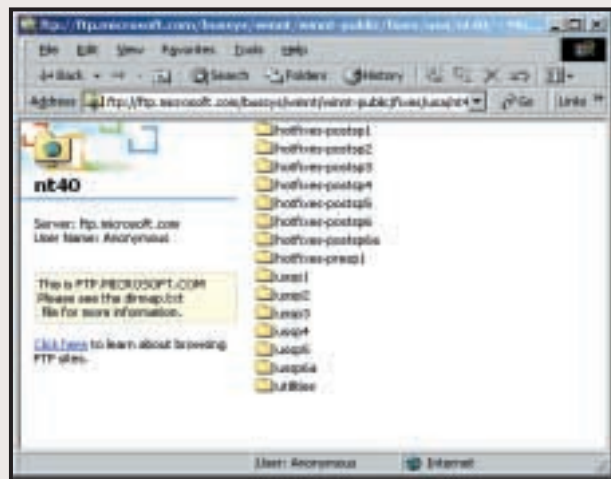
OK, there was a rollback feature, but it only worked if you had elected to back up the replaced components before you installed SP2. In some cases, this fix forced a reinstall of NT4 from scratch! Microsoft retreated – tail between its legs – and four months later came out with Service Pack 3 which, mercifully, was a lot better. However, even this was not entirely bug-free – it introduced problems with VB5, SoundBlaster cards and tape drives.

Since then, Service Packs have been useful in ironing out many bugs and security holes. Generally, most applications that ship for NT require a minimum of SP4 to operate, because of significant changes to the kernel and file systems. Office 2000, for instance, refuses to install unless SP4 is present.

Microsoft is by no means the only offender when it comes to network operating systems. Novell is another Service Pack sinner. In the first 18 months after the release of NetWare 5, Novell has released four Support Packs. According to the company, Support Pack 3 fixed between 1,200 and 1,500 bugs, although many were minor, such as screen spelling mistakes or unnecessary error messages.

Bug fixes aren't the only problem. For some time Microsoft used Service Packs as a way of distributing software enhancements, an example being Service Pack 4. In addition to fixing bugs, it added support for web-based network management and utilities to increase the reliability of NT.

While laudable, this strategy makes for very big and frequent support packs. Service Packs should really be fixing problems, not adding feature enhancements, a trend that was started with the separate release of the NT4 Option Pack in November 1997. The last two Service Packs contained only bug fixes.

Microsoft has also changed its testing of Service Packs. Now, after each bug is fixed, the software is run through the entire testing suite, eliminating complications and conflicts, or so the company claims.

CONTACTS

Roger Gann welcomes your comments on the Windows NT column. Contact us via the *PCW* editorial office or email **nt@pcw.co.uk**

A taste of the cat

Eight out of 10 Unix users may prefer to scan in URLs in future, says Chris Bidmead

AUS company called DigitalConvergence is trying to get you excited about a new addition to your desktop. It calls it the :CueCat, and the 'Cat' part apparently stands for 'Keystroke Automation Technology'. This enables the company to say that: 'The Cat is the biggest computer innovation since the mouse.' Geddit?

The device is actually a barcode reader that you plug in between your keyboard and the normal keyboard connector socket. The manufacturers say: 'The :CueCat reader will change how you use the Internet forever by interacting with DigitalConvergence's proprietary codes, ISBN codes, UPC codes and many others. With just one swipe, the :CueCat reader instantly transports you to a specific web page. It's that easy!'

The idea is that you see the proprietary DC codes in a catalogue, swipe the one under the product you're looking for, and lo, your web browser goes straight to the correct URL. Putting the marketing hype to one side, the Cat makes a pretty good general-purpose barcode reader. And at a great price, too – it's currently being given away free in Radio Shack stores across the US.

The :CueCat web page at www.crq.com. US citizens can pick up the :CueCat free from Radio Shack stores, but there are disputes about what the distributor means by 'free'

The CD-ROM accompanying the :CueCat only comes with Windows software

So what has this got to do with Unix? Well, a free barcode reader deserves free software to go with it. The CD-ROM accompanying the :Cue:Cat only comes with Windows software, so a few Linux enthusiasts have written their own code to make it work. One of them, Michael Rothwell, put his program up on his website at www.flyingbuttmonkeys.com, only to receive a stiff letter from DC's lawyers. The letter (there's a copy on Rothwell's site) hints that his publication of the code is, in some unstated way, 'in conflict with intellectual property rights owned by Digital Convergence'. DC told him to take it down. He has, because he can't afford a lawsuit, however trumped up the charge may be.

All Rothwell's code does is read the ASCII output from the Cat (fed via the keyboard connector into standard in) and do some translation to turn it into comprehensible text strings. He then does some fancy GUI things to make it all user-friendly. He hasn't disassembled the code inside the Cat and he hasn't even touched the accompanying CD, so he's in no way committed to the 'acceptance of our License Terms'. These terms, by the way, include the post-hoc claim that 'The :CueCat reader is only on loan to you from DigitalConvergence and may be recalled at any time'. Radio Shack in San Francisco certainly made no mention of that when my good friend Bruce breezed in to pick up the free unit he mailed to me recently. Bruce happens to be a lawyer, and he doesn't think DC has a leg to stand on.

If you're a Linux user in the US, or have a Stateside friend who can get hold of a Cat, you can download a different decoder from www.barcode-search.com/cuecatd11.zip (that version number '11' may change, of course). Alternatively, you could search http://freshmeat.net with the string

'cuecat' for other published Cat utilities. If you don't find them by the time you read this, DC's intimidation has probably paid off – but I'm hoping that common sense will prevail.

The best job in the world

Those of you who have been following this column since its inception will appreciate what tough work it is for me. My rewards are continued contact, through Unix, with some of the brightest minds on the planet, as well as the opportunity to play a small part in the evolution of the most exciting computer revolution of my adulthood – Linux and the free software movement in general. Then there's the long-term loan of tasty equipment from manufacturers, a handsome monthly stipend from *PCW*, and, of course, the adulation of my loyal readers. It's a tough job, but someone has to do it – and after seven years I'm still thrilled to bits that it's me, and I'm very grateful to all of you for sustaining me in what has to be the one of the best jobs in the world.

OK, I exaggerated a bit about the adulation, but I do get some pretty nice emails, among the influx of problems and gripes you send me. Says Andrew Foulsham: 'Congratulations on an excellent *PCW* column – it's a great source of info on what's happening in the Unix world, as well as some very useful tips! Keep up the good work and a fascinating column.'

Robin Matthews also finds the feature useful: 'Great column! Thanks and keep up the good work.'

Unix enthusiast Jeffrey Rollin is pleased that his field of interest is being covered: 'Well done for keeping the spirit of Unix alive! Like many of your readers, I tend to turn to your column first every month, and am glad of this little piece of sanity in Wintel land. I have been an avid reader of your column since about 1996 (long before I even dared install Linux on my system).'

Finally, it's thumbs-up from reader

Bruce Winkless. He says that: 'The column remains excellent reading...'

Thanks, everybody. I know I'm not being too zippy with my replies to emails at the moment, but as the Linux boom escalates, the postbag swells. I'm doing my best.

Email tends to get my priority attention if it's:
1. ASCII only – no HTML, MIME or (particularly) proprietary word processor formats, please.
2. Specific – if you're reporting a problem, please define it as closely as possible. Tell me what operating system and/or distribution you're running, and pass on any error messages you think might be relevant.
3. Emails should be free of automated signatures plugging products or services. Most readers have the good taste not to add deliberate junk to the end of their mailings (a short signature that perhaps includes your home URL is, of course, welcomed), but some free web mailers insist on appending plugs for themselves, and are best avoided.

Linux on IBM T20 ThinkPad

The newest addition to the 'tasty' stable of hardware here is an IBM T20 ThinkPad. I have a cunning plan for this powerful fully featured laptop, which I hope to reveal next month, if the various fiddly bits of compilation go right. Meanwhile, the task is to get Linux onto it. Although IBM now fully supports Linux on its range of laptops, it hasn't yet got the full Linux-on-Thinkpads rollout,

er, rolling, and the machine arrived with Windows Professional 2000 sprawling all over the 12GB drive.

This is something I obviously need to remedy right away. I used the SuSE 7.0 LiveEval disc to have a preliminary poke at the T20's Linux capabilities. The built-in DVD drive happily booted the CD-ROM, and was subsequently automounted by the SuSE installation, so I have smoothly integrated CD-ROM capability (DVD, alas, is a separate and highly litigated issue – see www.lemuria.org/DeCSS). The machine has a built-in Ethernet connector, which Linux recognised right away, and as far as I can make out the APM stuff is functioning correctly, giving me suspension and hibernation.

The catch is the X configuration. SuSE's usually excellent SaX X configuration tool doesn't recognise the video hardware. Luckily Rich Payne has put up a helpful web page at http://talisman.mv.com/laptop.html. Rich had come across the same problem with X on the T20. 'After some searching on the net,' he says, 'I found that the
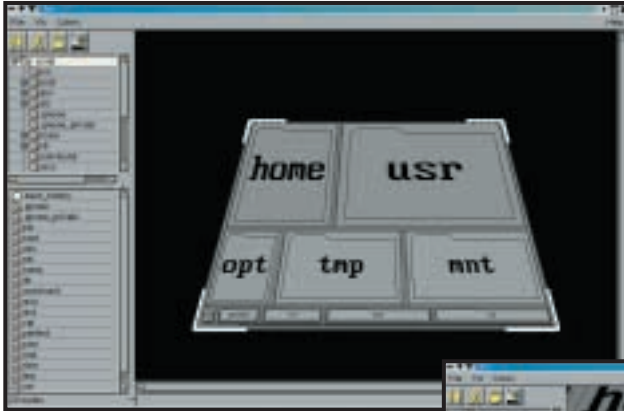
This is fsv, a fascinating Linux utility by Daniel Richard (http://fox.mit.edu/skunk/soft/fsv). It's designed to give you 'an intuitive, visual means of overviewing the layout and content of a file system'. The author says: 'It translates a mass of information about files and directories (such as relative sizes) into geometry, constructing a 3D representation which can be easily viewed and manipulated.'

By clicking on any particular directory shown in the tree list in the top right-hand corner you can zoom to view for a closer look

Savage chipset in the laptop was unsupported by XFree86 (neither 3.3.6 nor 4.0) but that the XFree86 people were working on it. Luckily I then came across a link to S3's ftp site and a patched SVGA server.'

So I've downloaded the driver he recommends and will be using his XF86Config file. The problem is that the SuSE 7.0 LiveEval CD uses XF86 4.0, and the patched XF96_SVGA driver only works with XF86 3.3.x. This means I'm going to have to do some tweaking. I'll let you know when it's all up and running.

Livening up SuSE LiveEval

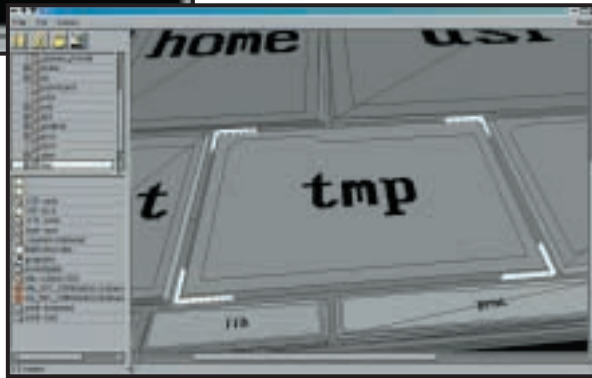I did take the opportunity, though, of exploring the SuSE LiveEval with the idea of working out how to push it beyond its built-in limitations. The version of SuSE 7.0 that was on last month's cover DVD (it's also available for a couple of quid from www.linuxemporium.co.uk) is an excellent easy way in to the Linux adventure, but as it stands it doesn't give you much room for extension or configuration. This is because most of the files remain on read-only CD-ROM, and most of the rest are in the limited space provided by the RAM disk filesystem. The biggest space you have to play with is in the /home directory, which is mapped to a 100MB file inside whatever kind of file system you already have installed by your existing operating system.

Of course, SuSE would probably prefer you to remove your LiveEval installation and go out and buy an official boxed version. Fair enough, but you don't necessarily need to do this. One thing you could do, once you're sure you want to install Linux permanently, is reboot with a DOS disk containing the fips DOS partition-splitting utility. This will shrink down the partition your existing operating system is running on to make room for Linux. However, you can enlarge the SuSE installation without repartitioning by extending a 'filesystem within a file' trick that SuSE already uses.

I'm assuming that you have more room on your existing first partition, where the suselive files are being stored. One of these is a complete, ready-to-go ext2 filesystem inside a single file, which is accessed from Linux by being what's called 'loop-mounted', (a file in a filesystem already on a mounted device is mounted to create another filesystem).

You could build another of these loop-mountable files from scratch, but it's easiest to copy the existing file, mount it and clear its files to create space.

The SuSE LiveEval installation should have already mounted your existing first partition. If it's a Windows C drive it will appear under the mount point /Windows/C. If you cd to that directory you'll see the files named suselive.*. The one you want to copy is suselive.usr. You can check this by running the following command:

```
file suselive.usr
```

which should return the information:

```
suselive.usr: Linux/i386 ↙
ext2 filesystem
```

(*Key: ↙ code string continues*)

Use a text editor (vi is the standard) to open /etc/fstab, which is the file where the mounts are defined. You'll see /home created there as a loop mount on the suselive.usr file. Add a new, similar line below that:

```
/windows/C/↙
suselive1.usr ↙
/home/var1 ext2 ↙
defaults,↙
loop=/dev/↙
loop2 0 0
```

Now copy the file suselive.usr to suselive1.usr:

```
cp suselive.↙
usr suselive1.↙
usr
```

Next, create the mount point for this filesystem-within-a-file. Directory creation uses up a 'node' (think of a node as the low-level coat hook on which you hang a file or directory name). The root file system as set up in your RAM drive is somewhat node-starved and might soon complain 'no room left on device'. This warning can puzzle beginners who have accumulated many tiny files on a device. The total size of the files may be nowhere near the size of the device; in this case the warning 'no room left on device' indicates you've run out of nodes.

In the SuSE LiveEval setup, the most generous room node-wise and space-wise is in the /home directory, which is actually inside the suselive.usr file. So:

```
cd /home
mkdir var1
mount var1
```

Now we can duck inside var1. It's a full copy of the existing /home directory (because it's a copy of suselive.usr). We can delete everything with:

```
rm -r *
```

This will leave you with almost 100MB more space to play with.

CONTACTS

Chris Bidmead welcomes your comments on the Unix column. Contact him via the *PCW* editorial office or email: **unix@pcw.co.uk**

Four into one does go

Something's got Gordon Laing all excited: a new set of drivers and the prospect of dual FC-PGAs

The *Hands On, Hardware* mailbox continues to spilleth-over with requests for chip compatibilities, motherboard tweaks and, of course, the hot subject of overclocking and cooling solutions. Consequently, this month's exciting instalment contains a veritable cornucopia of tips and tricks to get your PC going that bit faster for the least outlay – minimum effort, maximum return as the cider ads and TV chefs are prone to say!

Graphics drivers

Two months ago, in October's *PCW*, I thought I'd try my hand at overclocking my new Creative Labs GeForce2 GTS graphics card. A little Registry editing later and I'd revealed the hidden control panel that lets you adjust the memory and core clock speeds. Sadly, the return was modest to say the least – well, it was at the meagre 1,024 x 768 16bit mode I play my games!

What I did discover, however, was the dramatic difference that upgrading to the latest drivers made. My test system consisted of my trusted Asus P2B BX-chipset motherboard with 512MB of PC133 SDRAM, Seagate 18XL Ultra160 SCSI hard disk, Adaptec Ultra160 card and an Intel Pentium III running at 866MHz – yes, on a 133MHz front-side bus (FSB), meaning I was also overclocking both the BX chipset and AGP graphics by 33 per cent.

I did my original tests using the drivers supplied by Creative Labs. In Quake III Arena under Windows 2000, using the standard *PCW* group test settings and 'low-quality' stereo sound, I achieved 94.1 frames per second (fps) (see graphs). Downloading and installing nVidia's Detonator 2 reference drivers, however, saw a dramatic increase to 103.2fps under precisely the same configuration.

A great result, but more was to come. Just a few days after I had written last month's *Hardware* column, nVidia announced its Detonator 3 reference drivers. Another eager download later and my results shot up again to an impressive 110.4fps.

I dual boot my system with both Windows 98 SE and Windows 2000, which offers a great opportunity to directly compare performance between the two operating systems with identical hardware behind them. Using Creative's supplied drivers and the same Quake conditions, my system scored 101.4fps, compared with 94.1fps under Windows 2000. Strangely, the Detonator 2 drivers didn't want to play with Windows 98 on my system, but the latest Detonator 3 drivers worked like a dream. Again with the same hardware and Quake settings, the frame rate increased to a whopping 121.3fps.

Sure, it's still just over 10fps faster than the same configuration running Windows 2000, but check out the differences between Detonator 3 and the original supplied drivers: Windows 98 saw an increase from 101.4 to 121.3fps, while Windows 2000 enjoyed a boost from 94.1 to 110.4fps. That's about a 20 per cent performance increase on both operating systems for the cost of a download – fantastic! I concluded October's column by enthusing about running the latest drivers for your graphics card, and this month's results only reinforce the point.

What's the point?

Spookily, Giles Read, Gain Lee and Chris Solbe all asked, within a few hours of each other, what the point was of achieving a faster games frame rate than the actual monitor refresh rate? Good question, particularly since most CRT monitors in the world are set up to run between 60 and 85Hz, which effectively means 60 to 85fps. Note that, for a flicker-free display, you should try to run your CRT monitor non-interlaced at 70Hz or above.

With today's super-fast graphics cards, it's easy to have a situation where a game may be ploughing away at over 100fps, while the monitor is only redrawing, say, 70 times per second. In this instance, the monitor will clearly not be displaying every frame that's generated. However, the game will still be playing faster than it would be if it were matched to the display refresh rate, which is preferable in almost all cases.

If you're experiencing tearing or other undesirable quality artefacts, then you may wish to synchronise your gaming graphics with your display. There are usually options for both DirectX and OpenGL in a graphics card control panel, that lock, or synchronise the game to the refresh rate of your display, although on my GeForce2 GTS it made no difference to Quake III's 100-plus fps performance.

Ultimately, unless you are experiencing undesirable effects, then I wouldn't worry about your graphics card generating higher frame rates than your display's refresh rate. Simply relax in the knowledge that both your graphics card and monitor are working as best they can, and you're reaping the benefit from both. I would, however, be interested to hear from anyone who's experienced games performance issues at various display refresh rates.

Games monitor: is there any benefit in having a faster games frame rate than your screen's refresh rate?

Dual fuel

Regular visitors to this column will know that I'm well into dual-CPU systems, an interest that really started almost a year ago with the symmetrical Plastic Pin Gr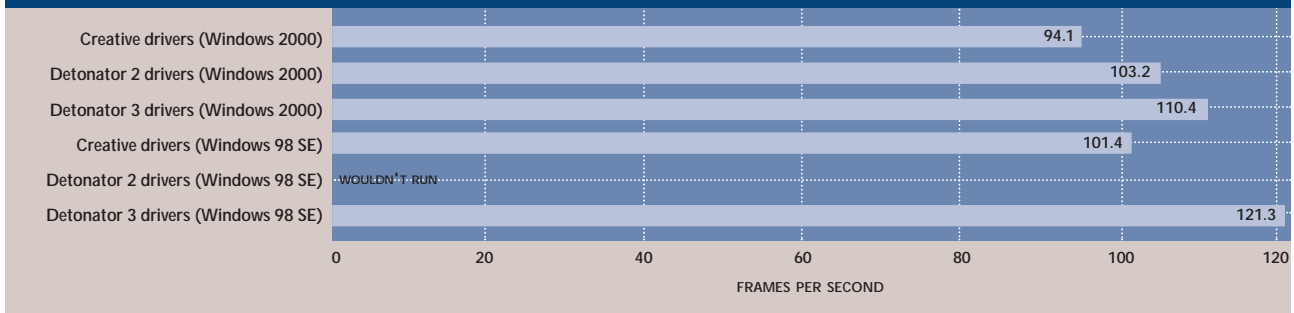id Array (PPGA) power of the Abit BP6. In last month's *Hardware* column I got hold of the MSI 694D Pro motherboard, based around VIA's Apollo Pro 133A (694X)
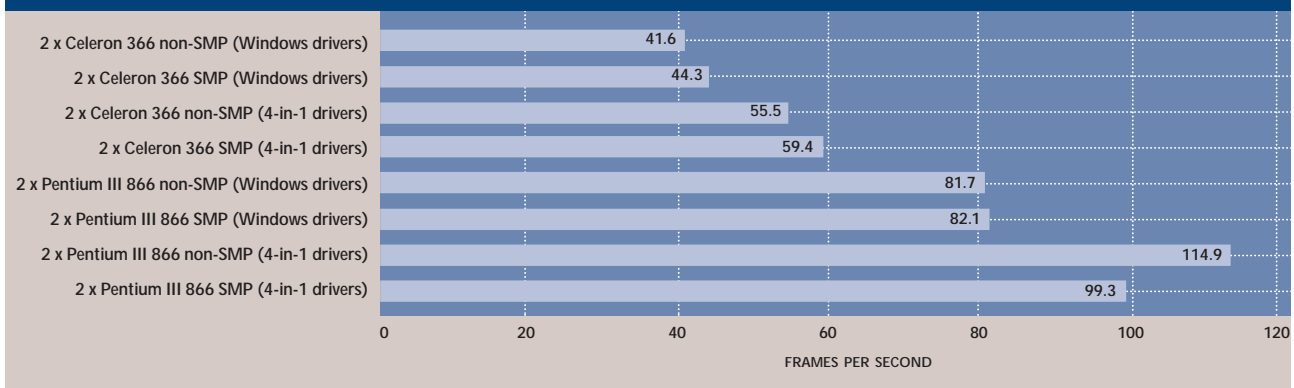
## GeForce2 GTS Quake III scores

(866MHz PIII, 512MB PC133, Asus P2B)

	FPS
Creative drivers (Windows 2000)	94.1
Detonator 2 drivers (Windows 2000)	103.2
Detonator 3 drivers (Windows 2000)	110.4
Creative drivers (Windows 98 SE)	101.4
Detonator 2 drivers (Windows 98 SE)	WOULDN'T RUN
Detonator 3 drivers (Windows 98 SE)	121.3

FRAMES PER SECOND (0, 20, 40, 60, 80, 100, 120)

VIA 133A Quake III scores

(MSI 694D Pro, GeForce2 GTS, 128MB PC133, Windows 2000)

	FPS
2 x Celeron 366 non-SMP (Windows drivers)	41.6
2 x Celeron 366 SMP (Windows drivers)	44.3
2 x Celeron 366 non-SMP (4-in-1 drivers)	55.5
2 x Celeron 366 SMP (4-in-1 drivers)	59.4
2 x Pentium III 866 non-SMP (Windows drivers)	81.7
2 x Pentium III 866 SMP (Windows drivers)	82.1
2 x Pentium III 866 non-SMP (4-in-1 drivers)	114.9
2 x Pentium III 866 SMP (4-in-1 drivers)	99.3

FRAMES PER SECOND (0, 20, 40, 60, 80, 100, 120)

chipset. It's the first and only dual-Flip Chip-Pin Grid Array (FC-PGA) motherboard I've tested, with some quite interesting results when engaging both CPUs.

I put together a system using this motherboard, 128MB of PC133 SDRAM, a 13.6GB UltraDMA66 Quantum Fireball Plus KX hard disk and a Creative Labs GeForce2 GTS graphics card – Windows 2000 Professional was used as the operating system. I ran tests using a pair of 366MHz PPGA Celerons and a pair of 866MHz FC-PGA Pentium IIIs.

For direct comparison with earlier scores, I used nVidia's reference Detonator 2 drivers and tested using the standard *PCW* Quake III options, although, unlike the system documented above for the Detonator 3 tests, this PC had no sound at all. Sound generation can have quite an impact on games performance, particularly if you're running in four-channel A3D 2.0 or EAX modes. In plain stereo, you're looking at around a 10 per cent hit on frame rate
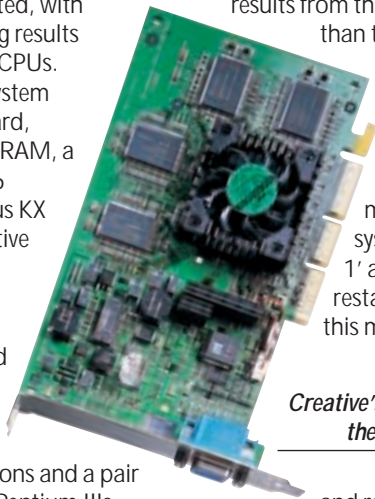
using Quake and its 'low quality' settings. Consequently, I expected the results from this system to be quicker than those on a PC with sound.

I used Quake III Arena as it offers a Symmetric Multi-Processor (SMP) mode that employs the additional processing muscle of dual-CPU systems. Simply type 'r_smp 1' at the Quake console and restart the game to activate this mode. Typing 'r_smp 0'

Creative's GeForce2 GTS helped test the dual FC-PGA motherboard

and restarting will deactivate it. I experienced a little reluctance from Quake to start up in SMP mode, but after two or three attempts, it normally works.

Celeron scores
Using a pair of PPGA 366MHz Celerons and a 66MHz memory clock, the system scored 41.6fps in Quake's non-SMP mode and 44.3fps in SMP mode. Interestingly, the VIA chipset allows the memory to be driven at the FSB plus

33MHz, so I ran the tests again, this time driving the memory at 100MHz. The system scored a slightly higher 43.4fps in non-SMP and 47.4fps in SMP mode.

Note that in my Seti@home raw calculation test, the dual-366MHz Celeron system ate through one per cent of a work unit in 10 minutes 30 seconds at 66MHz memory and nine minutes 30 seconds at 100MHz memory. Coupled with a slight increase in gaming frame rates, I'd recommend any VIA 694X-user running at either 66 or 100MHz FSB to go for this option – so long as their memory is rated at speeds 33MHz faster than their FSB of course.

Out of interest I also rebuilt the same system using my Abit BP6, which scored 56.8fps in non-SMP and an impressive 74.3fps in SMP mode, and this is using a 66MHz memory bus; incidentally, this system ran through the Seti test in 10 minutes 30 seconds.

In last month's issue, I therefore concluded that the BX chipset appeared to be superior at getting the most out of dual-CPU systems – well for Quake anyway – and registered my disappointment that even in single-CPU mode, the VIA chipset was about 25 per cent slower. I mentioned this to *PCW*'s very own Jason Jenkins who, after testing

Head to VIA's website for driver updates

a load of motherboards recently, quite rightly asked if I had installed the latest VIA 4-in-1 drivers. Rather embarrassingly I had not.

VIA 4-in-1

If your motherboard uses a VIA chipset, then head straight over to VIA's website (www.via.com.tw) and download the latest 4-in-1 driver. The latest version 4.24 (as of 10 August) is a 799KB download you will not regret. In one simple installation, it updates four crucial components: IDE Busmaster 2.1.49, VIA AGP Driver 4.03, IRQ Routing Driver 1.3a and VIA INF Driver 1.02.

That's all there is to it. I re-ran the Quake tests with both the Celerons and Pentiums and was astounded. With the pair of 366MHz Celerons (running on the lower 66MHz memory bus), my system now scored 55.5 and 59.4fps in non-SMP and SMP modes, up from the previous 41.6 and 44.3fps figures before the new VIA drivers. Swapping to the pair of Pentium IIIs, my system scored 114.9 and 99.3fps in non-SMP and SMP modes, also up from the 81.7 and 82.1fps figures before.

Admittedly, there's still something strange going on with the VIA chipset in Quake's SMP mode, where scores are either virtually the same, or in some cases actually slower than single-CPU mode, but you can't argue with the new drivers. In non-SMP mode with the Celeron, the VIA platform matched the BX chipset, and certainly the Pentium III scores were much improved with these latest 4-in-1 drivers. I'm beginning to sound a bit like

a broken record now, but make sure you're running these latest drivers for the best performance!

Dual FC-PGA on BX?

While the VIA chipset has allowed me to test dual-FC-PGA systems, I'm still at a loss to make a direct comparison with the oldie-but-goldie BX chipset. The problem with the Abit BP6 BX motherboard is that it only talks to PPGA Celerons. PowerLeap's Neo-S370 adaptors may let you pop an FC-PGA CPU into a PPGA socket, but no-one in the world seems to have got a pair working on the BP6, including myself and all the enthusiasts at www.bp6.com.

Thinking this was a Powerleap/Abit problem, I tracked down an aging Asus P2B-D BX-motherboard, supporting dual Slot 1 CPUs. My hopes were high, as my normal day-to-day system is based around a single CPU P2B motherboard, which happily talks to my 866MHz FC-PGA PIII through an Iwill Slocket II.

Overclocker's heaven – everything you could ever want

Anticipating this very day, I originally bought two Iwill Slocket IIs and now I've finally got to try them out.

Well, wouldn't you know it! Put one Slocket in either Slot and the system boots up without a problem, but put both in at the same time and nothing happens – just like the Abit BP6 with Neo adaptors. Now I may be wrong here, but both incidents point to the possibility that the BX chipset isn't happy talking to a pair of FC-PGA CPUs, regardless of the motherboard or adaptor in question. My pair of 866s are certainly certified for dual operation and they've worked fine as a

combo under the MSI/VIA motherboard.

I guess we'll never know how the BX could fare with a pair of FC-PGA CPUs. Then again, maybe a pair of Slot 1 Coppermine Pentium IIIs (those running faster than 600MHz) will work on a dual-BX system. If anyone is running such a configuration, please get in touch! In the meantime, I guess it's back to the MSI motherboard, although at least with the new 4-in-1 drivers, it's going much faster than before!

Final words

Before wrapping us this month's hardware, I'd like to mention a new UK supplier (new to these pages anyway) for fans, heatsinks, slockets and all manner of goodies for overclocking enthusiasts. Found at www.overclockers.co.uk, it's got everything a hardware enthusiast could ask for.

Speaking of which, there's just time for one last tweak. I've long spoken of running my Asus P2B BX motherboard at an overclocked 133MHz FSB. Well, with the option given on the four FSB jumpers, it'd seem rude not to. However, you may be at a disadvantage here if you're the owner of an Asus P2B BX motherboard without four FSB jumpers.

I was slightly confused to learn that this was the case with many Asus boards, but imagine my surprise when I saw that the P2B-D I sourced for this month's tests only had three jumpers, and no mention of 133MHz FSB in the manual. Fortunately, upon closer perusal of the motherboard itself, I discovered printed instructions stating that the FS2, FS1 and FS0 jumpers should be shorted at 1-2, 1-2 and 2-3 respectively for 133MHz FSB. Enjoy!

Private properties

You can tell a lot about a document by looking at its Properties. Tim Nott shows you how

I f you've ever right-clicked on a Word document file within Windows and then selected Properties, you'll know there's a wealth of information available about the document, its author and contents. You can get at the same information while editing the document (File, Properties). Some of this information – such as author and company – is taken from the Windows Registry, which is in turn taken from information supplied when Word or Office is installed.

If this information is wrong, you can correct the user name and initials from Tools, Options, User Information, which will update the Registry accordingly. You can't get at the company name this way, however. Although you can alter the latter by editing the Registry, it's far easier to do this by editing the properties of the template. This lets you change the company name, title and other options, which will be reflected in the documents based on the template. You can change the name of the template author, but this won't filter through to documents created using the template: the latter appears to be global and is set from Tools, Options, User Information, as mentioned above.

All this might seem unnecessary and time consuming, but there are some useful fields in there. For instance, if you put something in the Title field in the Properties Summary tab, this will be the default name that appears when you first save a document. So, if you're preparing a report entitled, say, 'Sales Analysis for December 2000', and have to do this every month, filling in the first three words will save you 18 keystrokes each time: you just have to append the month and year in the Save dialog box.
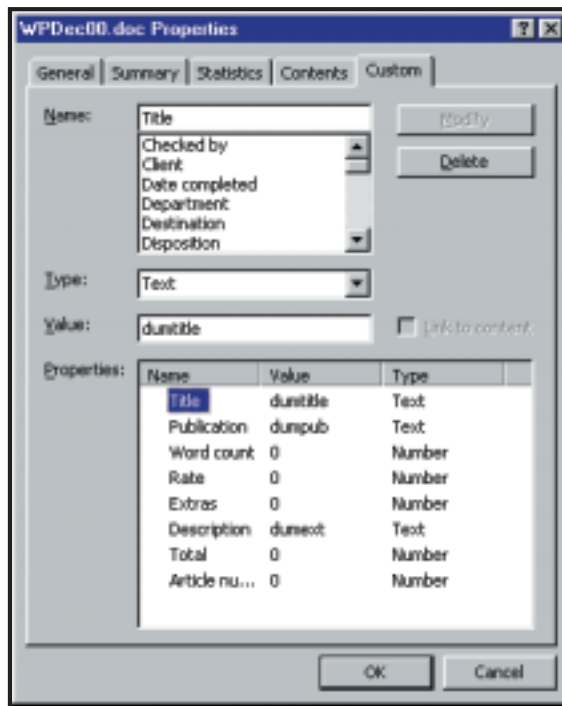
Custom user information can automate tasks

What's even more useful, however, is the Custom tab. By default, this is populated by all sorts of weird values, such as Disposition, Mailstop and Purpose, but you can easily create your own. You have four types of information at your disposal: text, number, date and yes/no. You can give each of these fields any non-conflicting name. It's also important to give them a default or dummy value, as doing this enables you to manipulate the information using macros. For example, each article I write has custom fields for the publication, number of words, article number, etc. With this information, I can run a one-button macro that creates, saves and prints an invoice.

What changes?

A number of readers have been suffering from the ever-changing Normal.dot syndrome. They start Word, work on some documents and then close Word. At this point, they are prompted to save the changes made to the global template, Normal.dot, which is fine, except they haven't made any changes: no new macros, no new or edited styles, no change in Autotext entries. And this message appears at every Word session. Although you can get rid of the prompt from Tools, Options, Save, the mysterious changes are saved anyway.

The answer to this is not exactly intuitive. According to Microsoft, this can happen if you are using the Microsoft Works 2000 add-in or the Stamps.com Internet postage add-in. Now, I wasn't aware you had to use stamps on the Internet. Closer examination shows that this is a way of stocking a postage machine over an Internet connection and, as it's only available in the US, is unlikely to be a problem for *PCW* readers.

The solution to the Works add-in lies in Control Panel, Add/Remove Programs. Remove the Word in Works Suite Add-In. This won't remove the Works Suite itself, but it will remove the extra Works-related menu items that appear in Word, such as File, New and Works Task Launcher.
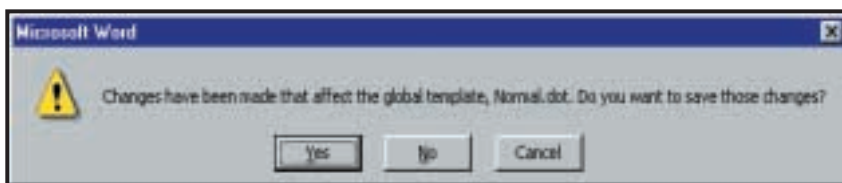
If this dialog box is unexpected, check for add-ins

Winners and losers

Get more from Excel by utilising the built-in macros. Stephen Wells explains how

Screenshot 2

Everything can be arranged in the Conditional Formatting dialog box

Excel worksheets are the subject raised by *PCW* reader Beryl Copthorne's query this month. She asks: 'Every weekday evening I have to prepare an Excel 97 worksheet recording our reps' daily sales. Is there a macro that can automatically highlight the best and worst performer? The number of sales people varies each day which affects the number of rows in each list.'
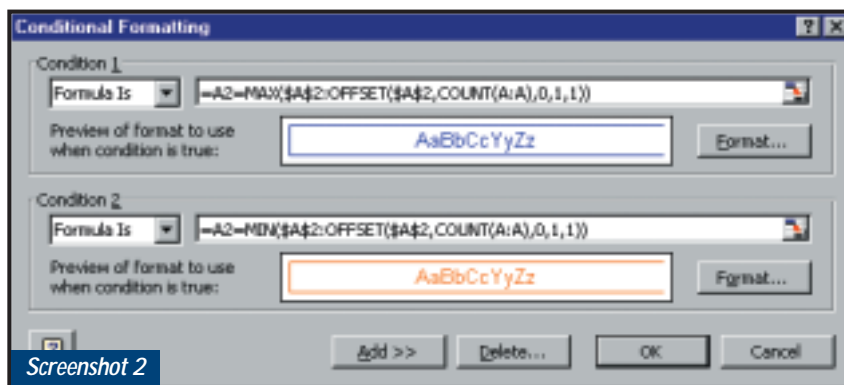
Since Excel 4 it has been possible to have conditional formatting within a cell. But from Excel 97 onwards, an advanced variation has been added with extensive capabilities like a built-in macro. Screenshot 1 gives an example of such a list with a day's sales totals in column A and the relevant reps' names adjacent to them in column B. This list can be as long as you like, and the procedure and the formulas used for the formatting are the same.

To find the highest sales in column A you use the MAX function. To find the lowest, use the MIN function. To find the number of rows in the range you use the COUNT and OFFSET functions together. COUNT just counts numbers in a list. OFFSET has five arguments. The first is the range involved. The second is the number of rows to count. The third is the number of columns to count. The fourth is the height (in number of rows) of the result. The fifth is the width of the number of columns in the desired result.

If you have a heading in row 1 and you know the number of reps is never going to be more than 50, you could establish the size of the range using:

```
=OFFSET($A$2,COUNT($A$2:$A$↙
50),0,1,1))
```
(Key: ↙ code string continues)

Note that the columns argument is zero and the height and width arguments are both one.

You don't have to use the first rows on a sheet. If you have other data above and below the range you could adjust the formula as with:

```
=OFFSET($A$30,COUNT($A$30:↙
$A$90),0,1,1))
```

But if you have nothing else on the worksheet, and as the COUNT function will ignore the text heading anyway, you might as well just count the whole column and simplify this to:

```
=OFFSET($A$2,COUNT(A:A),0,1,1))
```

You have now established the range for the day. So, using the illustrated example, click on cell A2 and choose Conditional Formatting on the Format menu. In the resulting dialog box click on the first arrow and change 'Cell Value Is' to 'Formula Is'. In the next box enter:

```
=A2=MAX($A$2:OFFSET($A$2,↙
COUNT(A:A),0,1,1))
```

This means that if A2 is the highest amount in column A, change the formatting. Click the Format button and enter the formatting you want for the highest number. In this example, the font changes to blue and there is a blue border on three sides. Now click the Add button and you can enter a second condition as shown in screenshot 2. The formula is almost the same. Just use MIN instead of MAX. The illustrated example shows similar formatting, too, except that the font colour and border is red.

Click OK and cell A2 is set up. Fortunately, the Format Painter tool on the Standard toolbar will replicate conditional formatting, so click on that tool and highlight down the column. The highest and lowest amounts will be instantly picked out.

If you want to pick out the reps' names, just add comparable conditional formatting to cell B2 and copy the formatting down column B. The formulas for column B are exactly the same as for column A. In other words, Excel lets you format cells in one column depending on results that appear in another.

Screenshot 1

Highlighting the most and least successful sales people on a list of varying length

CONTACTS

Stephen Wells welcomes your comments on the Spreadsheets column. Contact him via the *PCW* editorial office or email **spreadsheets@pcw.co.uk**. Please do not send unsolicited file attachments.

Can you see the join?

Mark Whitehorn delves deeper into inner and outer joins and explains some of their complexities

This month, we investigate further the exciting world of inner and outer joins. Inner joins are the normal ones we all use every day – they simply match data in the two fields concerned and produce a table that has a row for every match. An outer join allows you to see all the records from one of the tables, whether or not there is a match in the other table. Given the tables Car and Employee (see screenshot 1) and a left outer join:

```
SELECT Car.CarName, ✓
Employee.[First Name], ✓
Employee.[Last Name]
FROM Car LEFT JOIN Employee ✓
ON Car.CarID = ✓
Employee.CarID;
```

(*Key: ✓ code string continues*) we can see a list of all cars and the employees who own them.

As we said last month, this is actually a left outer join but the 'OUTER' word can be silent in the SQL statement. I say 'can' advisedly because the SQL standard says the word is optional. The standard's flexibility is admirable but some implementations (like Access) default to leaving the word out, while others (like SQL Server) default to putting it in. This would be almost forgivable if it wasn't for the fact that both of these products come from the same company.

You'll find this database on this month's cover disc as an Access 97 file (DBCDEC00.MDB) and if you modify the query to:

```
SELECT Car.CarName, ✓
Employee.[First ✓
Name], Employee.[Last ✓
Name]
FROM Car RIGHT JOIN ✓
Employee ON Car.CarID ✓
= Employee.CarID;
```

you'll get a list of employees and the names of their cars where appropriate.

The left and right business simply tells you which of the two tables involved gets the thrill of contributing all of its records. So, for example;

```
Car LEFT JOIN Employee
```

shows all the cars and some of the employees, while:

```
Car RIGHT JOIN Employee
```

shows all the employees and some cars.

And, yes, all of this does mean that:

```
Car LEFT JOIN Employee
```

gives exactly the same result as:

```
Employee RIGHT JOIN Car
```

In the Access GUI an outer join is represented by an arrow that points from the table which will show all records to the table from which matching records will be chosen. So:

```
Car LEFT JOIN Employee
```

shows all the cars and has an arrow pointing from Car towards Employee
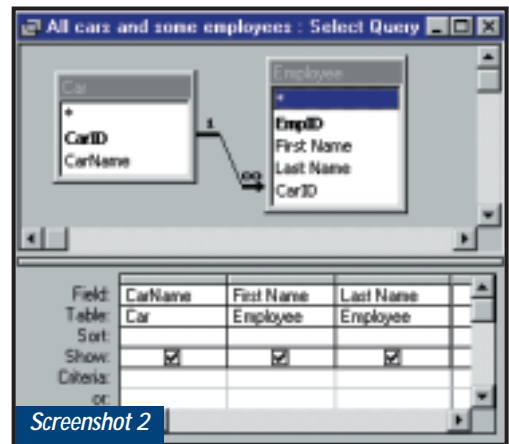
Screenshot 2

The outer join points from Car to Employee

(see screenshot 2). You can double-click on the join to change the type of join.

An outer join means you will see every record from one table or the other, and the left or right tells you which one.

This all sounds straightforward, so why (at least in Access) do some queries that contain outer joins fail?

Let's start with a simple query:

```
SELECT Sale.SaleID, ✓
Employee.EmpID
FROM Employee INNER JOIN ✓
Sale ON Employee.EmpID = ✓
Sale.EmpID;
```

(query 1)

which just lists the ID numbers from two tables that are joined with an inner join. This works fine and is stored as query 1 in the sample database.

We can also run an outer join to list all employee IDs and the names of their cars:

```
SELECT Employee.EmpID, ✓
Car.CarName
FROM Car RIGHT JOIN Employee ✓
ON Car.CarID = ✓
Employee.CarID;
```

(query 2)

and we can then run an outer join to list all the cars and the ID of the employees who own them:

```
SELECT Employee.EmpID, ✓
Car.CarName
FROM Car LEFT JOIN Employee ✓
ON Car.CarID = ✓
Employee.CarID;
```

(query 3)
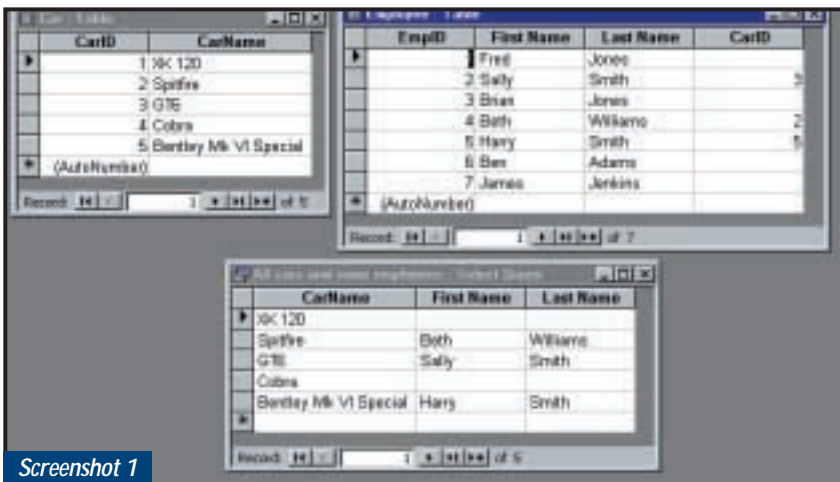
Screenshot 1

Two become one: You can see who owns which car using a left outer join
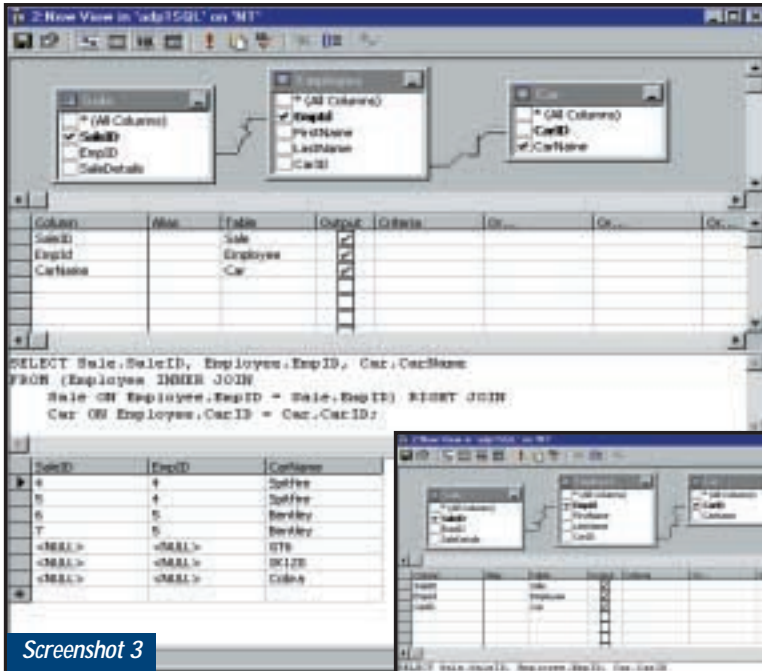
Screenshot 3

Above: SQL Server will sometimes run queries that Access won't…
Right: …but is this the answer you were expecting to see?

Screenshot 4

We can add queries 1 and 2 as:

```
SELECT Sale.SaleID,
Employee.EmpID, Car.CarName
FROM (Car RIGHT JOIN
Employee ON Car.CarID =
Employee.CarID)
INNER JOIN Sale ON
Employee.EmpID = Sale.EmpID;
```
(query 4)

and this one also runs fine.

I realise that all this successful running is getting boring, but fear not because when we add queries 1 and 3 as:

```
SELECT Sale.SaleID,
Employee.EmpID, Car.CarName
FROM (Car LEFT JOIN
Employee ON Car.CarID =
Employee.CarID)
INNER JOIN Sale ON
Employee.EmpID = Sale.EmpID;
```
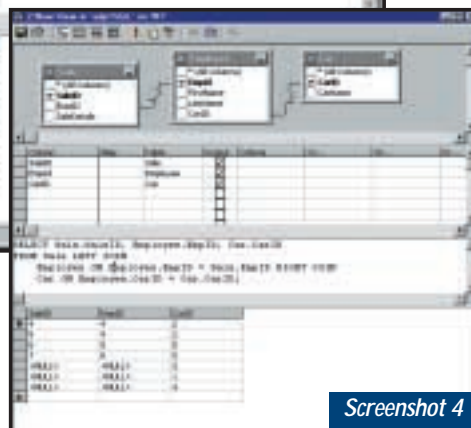(query 5)

it fails to run. The error message either complains: 'Join not supported' or 'The SQL statement could not be executed because it contains ambiguous outer joins'.

Why should this be? The Access help system reports that: 'A LEFT JOIN or a RIGHT JOIN can be nested inside an INNER JOIN, but an INNER JOIN cannot be nested inside a LEFT JOIN or a RIGHT JOIN'.

Hmm, I'm not sure I believe this. After all, query 5 suggests that not all outer joins can be nested and the fact that:

```
SELECT Sale.SaleID,
Employee.EmpID, Car.CarName
FROM (Employee INNER JOIN
Sale ON Employee.EmpID =
Sale.EmpID)
LEFT JOIN Car ON
Employee.CarID = Car.CarID;
```
(query 6)

runs perfectly happily does little to support the statement either!

In practice, Access seems to be objecting to performing two operations in the same SQL statement; the first generates a potentially incomplete set of records and the second performs a join that assumes it starts with a complete record set. For example, query 5 can be simplified to read:

```
SELECT *
FROM (a potentially
incomplete set of employee
records) INNER JOIN (another
table);
```

In other words, Access seems to refuse to perform an inner join where one of the record sets may be incomplete. It will also refuse to perform an outer join where the table that contributes all of its records may be incomplete. Thus simply changing the word left to right in query 6 causes it to bomb.

All this is made more complex because mixed inner and outer joins are not forbidden by the SQL standard and, indeed, products like SQL Server will perform both query 5 and the modified version of query 6 that Access won't run (see screenshot 3).

So, which one is 'right' – Access or SQL Server? This is a difficult question. Try to decide what answer table you would expect from:

```
SELECT Sale.SaleID,
Employee.EmpID,
Car.CarID
FROM Sale LEFT JOIN
Employee ON
Employee.EmpID =
Sale.EmpID RIGHT JOIN
Car ON Employee.
CarID = Car.CarID;
```

Do we expect to see all of the SaleID values and/or all of the CarIDs? Access refuses to perform the query, SQL Server produces an answer (see screenshot 4). Was it the one you were expecting? Is it better for a database engine to give no answer or one you didn't expect? What is the sound of a two-join SQL statement executing in a desert? I'll check with my Zen master and get back to you.

Validation vs input masks

In the October issue I discussed input masks and the way in which they are not applied at the table level. I suggested that for maximum control you use a project file. Jody Belka pointed out that validation rules are applied at the table level in Access .mdb files. This is correct and validation rules have been covered in this column in the past. My original draft of the column had a paragraph comparing and contrasting the two (they are similar but not identical), but space considerations meant I later surgically removed that paragraph without realising that this removed every reference to validation. Thanks to Jody for spotting the damage caused by my scalpel.

Messing with the beats

The derided drum machine is now a staple of our musical diet. Listen and learn with Niall Magennis

If there's one good thing that dance music has done, it's to rid the world of smelly drummers. OK, picking on drummers is too damn easy, but the drum machine was perhaps the biggest influencing factor that led to the birth of dance music.

The early drum machines sounded about as realistic as the drum kit you fashioned out of pots and pans and whacked with two wooden spoons when you were young. Over time, though, dance maestros decided to forget realistic drum sounds; what mattered was tweaking the bass drum sound until it was fatter than Bernard Manning and torturing the snare drum until it was punchier than a Prince Naseem jab.

An example of the lengths early dance music producers went to in order to create new sounds is the open hi-hat cymbal on S-express' *Theme from S-express.*
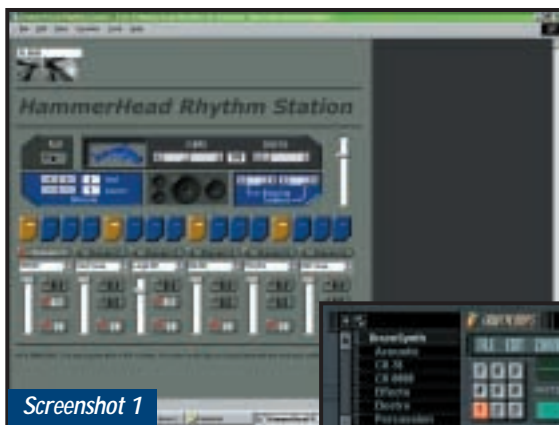
rigid timing. While accuracy is usually considered desirable, music is often more about feel. This strict timing was really a by-product of the minimal processing power available in early drum machines.

As processing power increased, manufacturers soon started adding shuffle controls. Shuffle basically means the drum machine will arrange the hits so they play around the beat slightly to try to give the pattern a more human feel, thus mimicking the imperfections of the rhythms of a real drummer. Musicians often call this swing, as the elements of the beat swing around the strict tempo. Even if you are using electronic drum sounds, such as those sampled from Roland's old TR808 or 909 drum boxes, shuffle can add a noticeably human feel to your drumbeats.

You can use modern sequencers, such as Emagic's Logic and Steinberg's Cubase VST, to create drum beats using MIDI to trigger drum sounds on a

Screenshot 3

Here's what a basic, four-on-the-floor pattern looks like

break from a real drummer, split it into its constituent parts and have the software analyse the groove of the player. Then save this as a preset to apply to your programmed beats.

However, the immediacy of a drum machine still holds significant charm. You can usually knock up a quick and dirty version of a beat using a drum machine in a fraction of the time you can using a sequencer. This is why even though many professional producers have more kit than an Airfix factory, they still have a number of drum machines in their equipment lists.

The good news is, you don't have to shell out a small fortune on a real drum machine, instead you can get some software for your computer that will not only offer you the immediacy of a real drum machine, but also have a whole host of extra features.

There are a number of these available on the Internet, such as Hammerhead. This one is not really distributed by the author any more as he went on to write B.Box for Steinberg, but you can download it from www.threechords.com/hammerhead for free (screenshot 1). You'll also find others that act as plug-ins for sequencers, such as Cubase and Logic. An example of this is the LM-4 plug-in that ships with Steinberg's budget Cubasis VST software.

However, my personal favourite is the strangely titled FruityLoops, written by Didier Dambrin. You can find a demo of this on the www.fruityloops.com website. Registration costs about £22 for the basic version and £44 for the pro edition. A small price to pay for a gem of an app.

Screenshot 1

Above: The immediacy of a real drum machine, for a fraction of the cost

Right: Pick a sound from FruityLoops' 909 kit

Screenshot 2

It's not a sample of a hi-hat at all; instead, the producers sampled an aerosol can being sprayed, because it cut through the mix sharper than the real thing.

Early drum machines also suffered heavy quantisation, meaning they played with pinpoint accuracy, hitting each beat in strict time. So strict, in fact, that no real drummer could ever play to such

sound card, an external MIDI synth or drum machine.

In fact, both Cubase and Logic can do more than merely apply shuffle to your drumbeats. You can select a huge range of grooves to impose on your programmed drumbeats to give them the feel of a range of different musical styles. You can even load up a drum
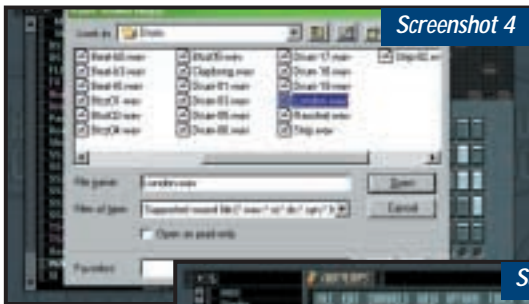
Above: Open a beat from within the Music Maker directory

Right: Creating layered beats

Screenshot 5

When you first load up the software, you're presented with the main window that houses a large grid divided up into sixteenths. On the left-hand side, you'll find a menu of sounds with drum kits as the first listing. This menu acts much like Windows File Explorer. Creating a drumbeat couldn't be easier. Just select a drum sound from the left-hand menu and drag and drop it on to one of the rectangular grey blocks on the left-hand side of the grid. I've chosen drum sounds from the 909 kit (screenshot 2).

Start with a bass drum, a snare, a closed hi-hat and an open hi-hat. You can create basic drum loops using these simple elements. Once you've selected your sounds you can start building your drum track. Left-clicking on one of the blocks will light up the block and means the drum sound will play at that point in the loop. If you make a mistake, delete the event by left-clicking on it.

Create a basic, four-on-the-floor pattern like I have in screenshot 3. Hit the Play button. OK, this drum beat won't win any awards for originality, but

Screenshot 6

The effects window for editing sound

it's a simple example to get you started. You can make changes to the pattern in real time as the loop is playing, but first try out the shuffle effect. Shuffle is controlled by the slider marked S on the far, top right-hand side. Play around with it until you find a setting that adds some feel to your drum track.

One of the keys to modern dance beats is the layering of programmed beats with sampled drum breaks. Load up a drumbeat to go along with your programmed drumbeat. Add a new drum channel by pressing Ctrl & D. Then load up a break by right-clicking over the new channel button you've created. Select Load Sample. I'm using the London.wav break in the sounds directory of Music Maker, which we gave away on our September cover disc (screenshot 4).

Click on the first block on the grid to make the break start at the beginning of your drumbeat and then press play (screenshot 5). You'll notice that the break sounds out of time with your programmed beat. What we need to do is adjust its speed, so it plays in time with your drumbeat. Click on the channel button and adjust the stretch factor to 32. The break now plays in time with our drum beat. You can repeat this process of adding channels and adjust the timing of breaks to create complex layered beats.

FruityLoops also has support for VST and DirectX plug-in effects. We're going to add some distortion to beef up the bass drum sound. First, click on the channel button with your bass drum sound. This brings up the channel settings window. Click on the FX2 button in the top right-hand corner. This sets the channel to send to the second effects bus. Effects buses are a way of avoiding having to send your whole beat to effects. Instead, you can select individual sounds to send to an effects bus, so only that sound will be processed.

Close this window, then hit F9. This brings up the effects window. Click on the FX2 button and then click on the down arrow of the top rectangular box. From the resulting menu select Plug-in,

Screenshot 7

Add built-in synths sounds and additional effects, using any number of free plug-ins

Screenshot 8

Experiment with settings to warp sounds into something completely different

VST and then Fruity Blood Overdrive (screenshot 6). The plug-in's editing window will pop up. If you've got your drumbeat playing you can start changing the plug-in settings to see how it affects the sound of the bass drum. You can create quite frightening bass drum sounds using this distortion plug-in.

As you can see, FruityLoops has a huge range of features. You'll find you can also use its built-in synths sounds and add more effects by downloading free plug-ins from sites such as www.directxfiles.com (screenshot 7).

The main thing is to experiment with the program. For example, if you open the channel window you can use the files and other settings to warp your sounds into something completely different (screenshot 8). You can also add to your palette of sounds by downloading drum samples from the Internet or using the wav files that come with programs such as Mixman and eJay.

FruityLoops really does allow you to create some astounding beats, without taxing your brain too much.

CONTACTS

Niall Magennis welcomes your comments on the Sound column. Contact him via the *PCW* editorial office or email: **sound@pcw.co.uk**

Photo finish

Give your holiday snaps a global audience with Ken McMahon's guide to the web photo album

With sales of digital cameras expected to outstrip those of conventional models some time in 2002, it shouldn't be long before we abandon the age-old pastime of sending friends and family into a state of near catatonia by forcing them to view endless streams of photographic prints.

These days, there are a great many ways in which you can ensure that your photographic genius reaches a wider audience. Traditionalists, for whom old habits die hard, might like to print copies of their digital images on an inkjet printer and pass them around the kitchen table in the time-honoured fashion. But the turn-of-the-century equivalent is surely to gather everyone round the PC to view the slideshow of the family expedition to the Millennium Dome, or the awesome record of your last bungee jump as recorded by your helmet-mounted digital camera (currently undergoing repairs).

But why restrict yourself to the half-dozen or so people who can squeeze around a 17in CRT, when you can have a global audience on the web? While it's easy enough to email a few images, sending more than that becomes cumbersome and people might not thank you for sending an unsolicited 15MB attachment of your hiking holiday in Snowdonia.

Some image-editing applications provide tools for creating a slide presentation, or an album, which you can email. The problem with these is that

Photoshop 5.5's Web Photo Gallery plug-in will help you to set up an index page

Avoid burdening people with massive downloads of pictures they may not be interested in

the recipient requires the right viewing software and, even if is this is encapsulated within the album file, the entire thing has to be downloaded, even if you only want to look at one image.

So what's the answer? How do you provide the world with access to your collection of photographs of rare birds

without them having to spend the weekend downloading the entire archive when they are only interested in the bar-tailed godwit?

The answer is obviously HTML. You can devote a section of your website to a photo library of images organised in the same way that professional stock photography libraries do it. Once again, the big problem is to avoid burdening people with massive downloads of pictures they may not be interested in, but how can they tell until they have seen them? What you need to do is provide an

index page of small thumbnail images that the viewer can quickly browse. When they see what they are interested in they can then click on it to view the full-sized version.

If this sounds difficult and laborious to set up – it is. The good news is that a number of image-editing applications

will do it for you. My particular favourite is Photoshop 5.5's Web Photo Gallery plug-in (see screenshot above).

First you need a folder of images – you can use them raw from your digital camera, but you might want to run them through an enhance filter first, rotate the portrait shots and rename the files.

To export a folder of images as a gallery website you choose File, Automate, WebPhotoGallery. In the dialog box you need to specify a source-image folder and a destination folder where the index page with the thumbnails, the thumbnail images, the full-sized images and the full-sized image HTML pages will be placed.

In the next section you can enter the site name, photographer and date – this appears at the top of each page. You can then select from three different thumbnail sizes – medium produces 75 x 60pixel jpegs of around 4KB. Caption each thumbnail with the filename – it's always worthwhile renaming the images, as even bognor99_01.jpg tells you more than DSCF001.jpg.

The final section lets you specify the size and compression of the 'full-sized'

images. You need to take care here. My Fujifilm MX600 zoom, at the highest-quality setting, produces images of 1,280 x 1,024pixels with a file size of around 650KB. If I choose best quality at 100 per cent of the original size, the files increase to 1MB in size.

Even with only 30 or so images this would require a big upload and probably exceed the web space capacity that most ISPs provide. Not to mention the fact that it would probably take around three minutes to download each to the viewer's browser.

The only advantage to using images this big is that the viewer can download and make good-quality prints – they are too big to view on most people's screens. A good compromise is to reduce the size to 75 per cent and set the compression to medium. This brings the file size down to around 100KB. Even though the images are being jpeg-compressed a second time (the first time being in the camera) the quality difference is negligible.

Photoshop produces a thumbnail index page – clicking on any of the images or its caption takes you to the full-sized image page. Once there, three navigation buttons at the top of the page allow you to browse forward or back through the gallery, or return to the index page. To add the gallery to your site, all you have to do is include a link to the folder.

Photoshop isn't the only application that can automatically generate web albums like this. MGI PhotoSuite III does

a very similar thing. You can organise collections of pictures into albums in PhotoSuite, then just select File, Create web page and, like Photoshop, it creates thumbnails and organises all the images into the relevant folders. However, PhotoSuite doesn't provide the handy nav buttons on the pages so that you can browse though (see screenshot below).

Ulead Photo Express 3 does a similar job and allows you to make selections from an album and then choose an HTML template page. Like Photoshop, Photo Express provides forward, reverse and home buttons so you can browse.

If you don't have your own homepage or website, it doesn't mean you can't create a web album for friends and family to view online. There are a number of commercial sites to which you can upload images and many provide additional services that you and your viewing public can take advantage of.

Kodak's Photonet service processes your films and uploads the images

Usually your gallery is password protected, which prevents just anyone rummaging through your personal albums. Album sites also provide printing services so you don't have to go through handfuls of expensive cartridges producing prints for relatives every time you go on holiday, get married or have children.

Some photo-album sites even offer film processing, so you can send your film to them, view the pics online as soon as they are processed and scanned and then order your prints.

The catch is that most of these sites are US-based. However, all is not lost for film buffs. Kodak's Photonet Online service is UK-based. All you have to do is take your film to a Kodak processor and ask for the Photonet service. They'll process your film and upload digital copies to the Photonet website, where anyone you give the password to can see them and order prints.
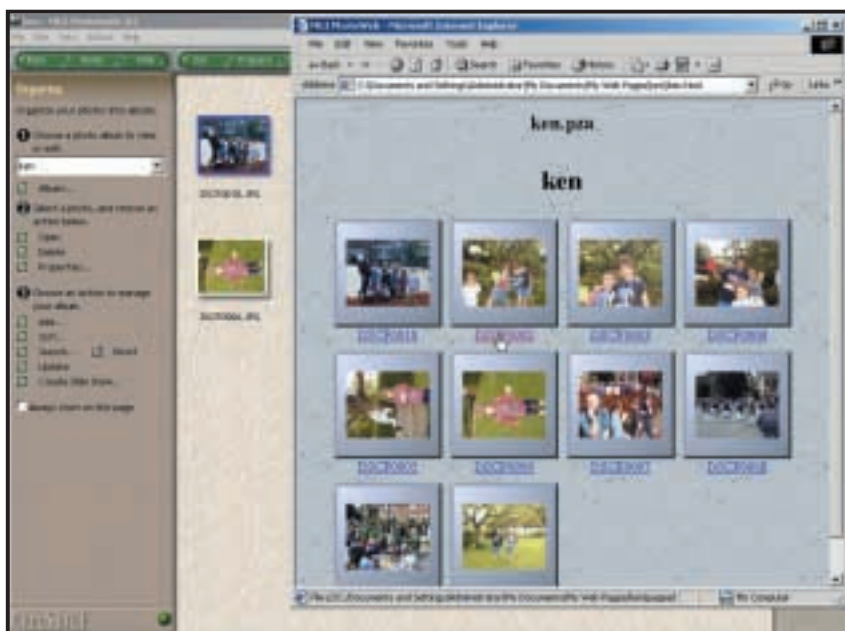
CONTACTS

MGI PhotoSuite III enables you to place selected images on to a web page

Perfectly simple

When your 3D models become overly complex, let Benjamin Woolley make those polygons gone

It's not just life that can get too complicated. So can 3D geometry. If you inspect any scene you have created closely enough, you are sure to find needlessly baroque geometry. Simple geometrical shapes made of primitives will be efficient, but anything handcrafted or, more commonly, edited using any sort of editing tool, will be laden with extraneous vertices and faces. The question is: should you leave them there or try to do something about them?

The obvious answer is that you should get rid of them. However, tweaking models is, as we shall see, a time-consuming business, so if your scene renders at an acceptable speed, you may as well leave it alone. Often, though, some form of simplification is unavoidable, particularly when the scene needs to be rendered in real time, such as in a game.

There are plug-ins now available designed to address this issue. However, you don't need fancy and often expensive software to start making useful efficiency savings. Screenshot 1 shows a rendered scene featuring the Apollo space capsule (from Viewpoint ModelBank). The capsule itself is made up of 34 highly detailed objects comprising more than 160,000 faces. Even the rocket cowling at the rear (screenshot 2) has nearly 5,500 faces.

How, then, would you simplify a model like this? It is a promising target for efficiency savings, as the basic shapes are geometrically simple. The main body, for example, is made up of a cone and a cylinder. The rocket cowling at the back is a slightly more complex curved surface, but it too can be simplified.

There are several techniques that can be used to simplify a model. The most obvious one is simply to delete extraneous faces or polygons manually. This technique is the most effective when you are tidying up after operations such as Boolean additions or subtractions (where you use one shape to alter the shape of another), as it can be obvious to the eye, but not to the computer, which bits of geometry have become obsolete.

Screenshot 1

The original scene containing the Apollo space capsule orbiting the moon

However, meddling with geometry in this way carries risks. You often have to fiddle with a series of faces that are already haphazardly interconnected. Removing one can open up unexpected holes, or even make the entire model geometrically irresolvable. A more common problem is that changing the geometry in this way could destroy the object's mapping co-ordinates, which means that any mapped material (a bitmap texture for example) could no longer be applied. With a basic shape such as a cylinder or cone, co-ordinates can be relatively easily reapplied, but for a more complex shape, with co-ordinates that were generated when it was first created, you may have to start rebuilding the object itself. For this reason, before messing about with any object, it is wise to make a copy, deleting the original only when you are happy with the results.

To create a simplified version of the cowling, I used a more constructive method of building a new model from scratch. This approach is not as laborious as it may at first seem. You have the original to act as a template, in this case the outline of the original object, that can be traced to create a profile for 'lathing' a new cowling. 3D Studio MAX has a useful feature called 'section', which can be used to create a cross-section of any object at any angle. However, you could easily create one for yourself by drawing around the object while viewing it through an orthogonal (ie left, right, front, back, top or bottom) viewport.

The section of the cowling revealed just how intricate the model is,
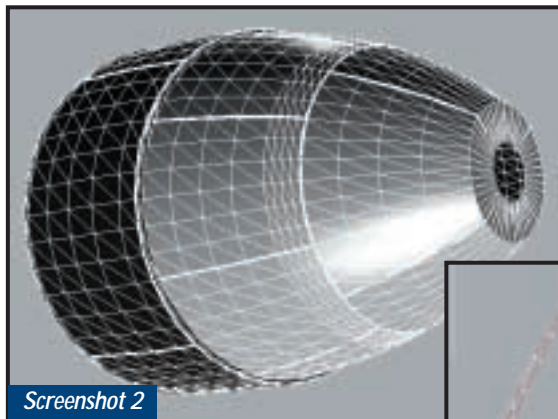
Screenshot 2

Above: The original rocket cowling. The overlaid wire mesh shows the edges, giving some indication of the complexity of the geometry

Right: The profile or cross-section of the cowling, the tick marks showing the position of the vertices
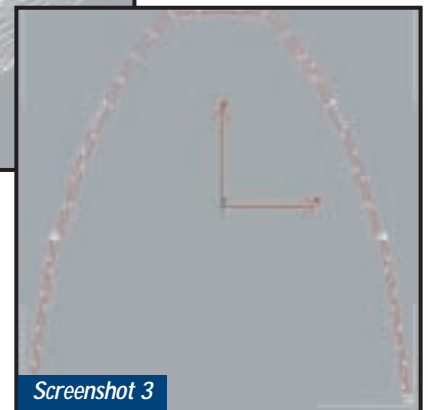
Screenshot 3

Screenshot 4

Left: The lathing profile, created out of the original profile cut in half and with as many vertices removed as possible Below: The object created from the lathing profile, before smoothing and materials have been applied

Screenshot 5

featuring an inner as well as an outer surface (screenshot 3). To turn the section into a lathing profile, I cut it in half, removed the shape for the inner surface and simplified the shape of the outer by removing as many vertices from the line as possible (screenshot 4).

Matching the geometry was only half the story. I had to deal with smoothing and materials too. Smoothing is the parameter that tells the renderer which faces are to be smoothed together so that they appear to be a continuous surface. This is a threshold set as an angle; faces at an angle to each other greater than the threshold have an edge where they join, otherwise the join is

Screenshot 6

The new, simplified object, now smoothed and textured

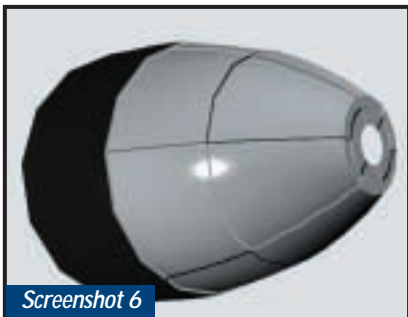rendered as a smooth curve. On most 3D editors, a threshold is automatically set for primitives so, for example, a sphere is always rendered with a smooth surface. However, sometimes objects created using processes such as lathing need to have smoothing manually applied, in which case you select the faces that make up the surface and set the threshold that is to apply to them.

The original had a complex multi/sub-object material, one that was made up of two materials, each of which were applied to different parts of the object. This meant having to isolate the sections of the object's surface to which the different materials should be applied. The new object also needed mapping coordinates, but these could be 'acquired' from the original (most 3D editors support this). Finally, to reproduce the raised edges of the engine covers I added a simple chequered bump map.

The result is a shape that, at a distance, would act as a passable imitation of the original, with less than a tenth the number of faces – 416 against 5,072 (screenshot 6). The most obvious sign that the geometry has been simplified is that the trailing edge of the cowling no longer forms a smooth curve.

An easier way of simplifying objects is to use a 'polygon reduction' plug-in. I have been experimenting recently with Polygon Cruncher version 4, which works with 3D Studio MAX and Lightwave (a time-limited trial version can be downloaded from www.blackfeet.com). This allows you to simplify the object progressively until the geometry starts to collapse. There is an interactive viewer, so, as you increase the level of polygon reduction, you can watch the effect on the object. The software worked well with organic forms. For example, applied

Screenshot 7

Screenshot 8

*Above: Monster's complex and craggy head
Left: As screenshot 7, but simplified using Polygon Cruncher*
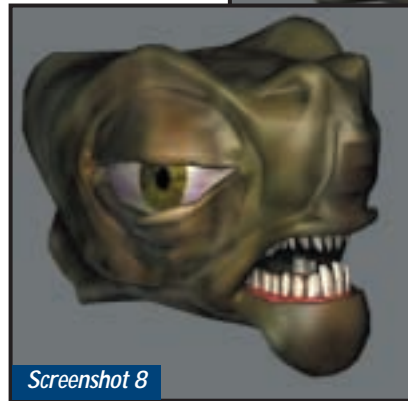
to a monster's fearsome features (see screenshots 7 and 8), it managed to reduce the face count from nearly 21,000 to 4,300 polygons with minimal effect – and keep all the mapping and textures intact. Interestingly it had a much harder job dealing with the rocket cowling, producing a horribly crumpled result when it tried to match my hand-built effort (screenshot 9).
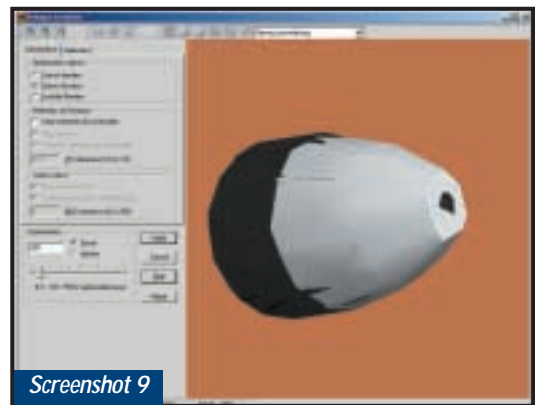
Screenshot 9

Polygon Cruncher's efforts at simplifying the rocket cowling. Note the interface, which allows the level of crunching to be set interactively, and shows the result in real time in the special OpenGL viewer

Getting a better view

Tim Anderson takes a look at VB printing and offers some handy programming tips

Videosoft's VSView is among the most valuable Visual Basic add-ons, and is an improved replacement for VB's Printer object. Users of Visual Basic often come up against the problem of printing a form. You can design a great form with labels, text boxes, images and shapes, but printing it is a nightmare. There is a PrintForm method, which sends a bitmap of the form to the printer, but the results are most unlikely to look good, because of the huge differences in size, shape and resolution between the on-screen form and the printer.

If you then look at VB's Printer object you find that you can get high-quality printing from VB, but only by throwing RAD (Rapid Application Development) out of the window. You have to calculate where to position each element and then output them using methods like Line, Circle, PaintPicture and Print, taking care to scale correctly and test for the end of the page. The Printer object has no visual component, so if you want to offer a print preview, you have to output directly to the surface of a form using the same methods.

Videosoft's VSPrinter control doesn't take away all the pain, but it is more helpful. The core difference is that unlike the Printer object, the VSPrinter knows what a document is. When you send it your output, it is held in memory, and can be previewed, saved to disk, exported as rtf (Rich Text Format) or HTML, or indeed printed. The document concept also holds good when you are building the pages. Along with many low-level methods, there are headers and footers, table methods, and the ability to render rtf text automatically. Along with the VSPrinter control, the package comes with a VSDraw control for creating charts and drawings, and VSViewPort to create scrollable areas. This allows you to create virtual forms that are bigger than the screen.

New features in version 7.0, which comes packaged on just two floppy disks, include the RTF and HTML export mentioned above, enhanced tables and

Print Preview in Visual Basic is not easy, unless you use a control like VSPrinter.
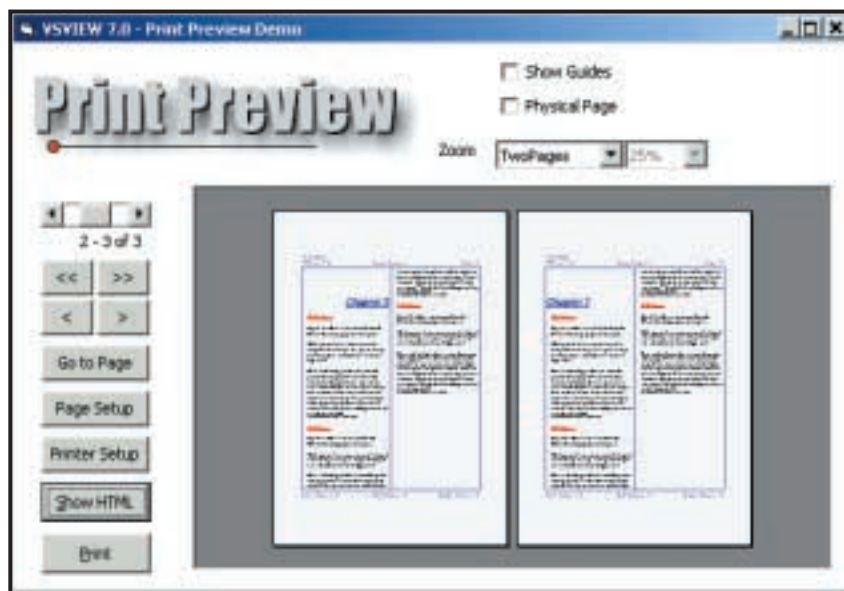
style definitions for page. It also features paragraphs and graphical objects to enable fast, standardised formatting, text search, support for hidden tags within documents, and a great ScrollIntoView method that lets you display a specified part of the document programmatically. You can also download documents directly from the Web. C++ is also supported. These welcome additions make 7.0 an excellent, lightweight product that soon becomes indispensable.

Controlling a scanner
PCW reader Gabriel Kissin has this query about using VB in conjunction with a scanner: 'I am writing a program which will need to control a scanner, including taking a scan and saving it to disk as a jpeg or gif and printing out copies. How do you do this?'

The easiest option is to explore the Imaging ActiveX controls that come with Windows. Imaging is a Windows component. It comes with Windows 95, 98 or NT, although users of early versions of Windows 95 should obtain the OSR2 update from the Eastman site, www.eastmansoftware.com.

Once installed, you will find several Kodak Imaging controls in VB's Components list. The Edit control (imgedit.ocx) handles image display and editing, while the Scan control (imgscan.ocx) covers control of the scanner itself. These are documented in the Windows SDK under the Imaging for Windows section. You can also obtain Professional versions (at a cost), which add features like OCR (optical character recognition).

The Kodak controls only work with TWAIN-compliant scanners, which is not usually a problem as most scanners are compliant. The mysteriously-named TWAIN is an agreed API for scanners and other imaging devices like digital cameras, so that application developers can support a wide range of devices. The place to go for information on TWAIN is www.twain.org, where you can find links to numerous tools and utilities. One that is free for non-commercial use is EZTwain, from www.dosadi.com, which comes with VB and Delphi examples.

Sorting arrays in VB
Paul Goss wrote in about a VB array problem: 'I'm writing a number-generating program to give me number combinations for the Lottery. I can create the numbers but I can't put them in sequential order.'

FIG 1 — **VB Bubble Sort**

```
Sub swap(arrVal as Variant, ✔
val1 AsInteger, val2 As ✔
Integer)

Dim tmp As Integer
tmp = arrVal (val1)
arrVal (val1) = arrVal ✔
(val2)
arrVal (val2) = tmp

End Sub

Sub sortarray(arrVal As ✔
Variant)
'Bubble sort – slow, but it ✔
gets there
Dim i As Integer
Dim j As Integer

 For i = highVal – 1 To 0 ✔
Step –1
  For j = 0 To i
   If arrVal(j) > ✔
arrVal(j + 1) Then
    swap j, j + 1
   End If
  Next j
 Next i

End Sub        (Key: ✔ code string continues)
```

FIG 2 — **ListBox Sort**

```
'Sorted property must be true    Next i
For i = 0 To highVal             For i = 0 To highVal
List1.AddItem ✔                  myarray(i) = List1.List(i)
Format$(myarray(i), ✔           Next i
"000000000")                     End If     (Key: ✔ code string continues)
```

FIG 3 — **Adding a document to the Recent Documents list**

```
Private Declare Sub SHAddToRecentDocs Lib "shell32.dll" ✔
(ByVal lFlags As Long, ByVal sNewdocument As String)
Const SHARD_PATH As Long = &H2
Const MAX_PATH = 260
Private Sub Command2_Click()
Dim sNewDoc As String
sNewDoc = "C:\YourPath\YourDoc.DOC" + vbNullChar
'Ensure you set this to file that exists
End Sub                              (Key: ✔ code string continues)
```

Surprisingly, Visual Basic has no function to sort an array. By contrast, Visual FoxPro has ASORT(), Delphi can sort a TList, and Java has an Arrays utility class stuffed with sort functions.

To answer the immediate question, Figure 1 shows how you can sort an array in VB. However, I don't recommend you use this code, although for an array with only seven elements, such as lottery numbers, it would be fine. It implements a Bubble Sort. The way this works is that you make several iterations through the array. On each iteration, you take every element and the one next to it, and place the bigger one in the higher position if it is not already there. The effect the first time round is that the largest number ends up in the last position, although the other numbers are not fully sorted. The next iteration finds the second biggest and puts it in the right place, and so on, until all the numbers are sorted. This is the simplest but least efficient sorting technique. The snag is the number of iterations required. For an array with n elements, it will make approximately n squared divided by two

comparisons. On my Pentium 233 it took about four seconds to sort an array with 1,000 elements.

If you are code-averse, a better solution is to use a hidden listbox. Simply put a listbox on a form; set its sorted property as 'true' and its visible property as 'false'. Figure 2 shows how to sort an array this way. The time for this approach went down to around one-fifth of a second, 20 times better. Incidentally, it is worth using an invisible listbox. Setting visibility 'true' doubled the time taken. Note that VB listboxes hold string items, which sort alphabetically. This means you need to pad numbers with leading zeroes using Format$, as in the example, to prevent five getting sorted after 4,000, for instance. Of course, you can also sort strings with this technique, which is case-insensitive for some reason.

For the best results, find a VB Quicksort routine. The Quicksort technique is to pick a pivot number and then sort the array by putting all the elements less than the pivot into some position below it, and all the elements higher than the pivot into some position above it. Then you repeat with recursive calls to Quicksort on each group. The recursion ends when a group has only two elements. This process can be fine-tuned in various ways. You can find VB Quicksort routines in the MSDN library or on the web. If you have the Office 2000 developer edition, check out the Code Librarian utility. The sample database includes several sort algorithms, including Bubble Sort, Quick

Sort and Shell sort. The Office 2000 Quick Sort was about six times faster than the listbox approach in my simple test and therefore about 120 times faster than a Bubble sort. If nothing else, it shows how significant the choice of routine can be in applications that make heavy use of sorting.

Recent Document list

Here is a neat Shell API function, to add a slick touch to your application. SHAdd ToRecent Docs adds documents used by your application to the Documents list in the Start menu. Don't bother doing this unless you have also registered a document type in the Windows Registry. Figure 3 shows the code to use.
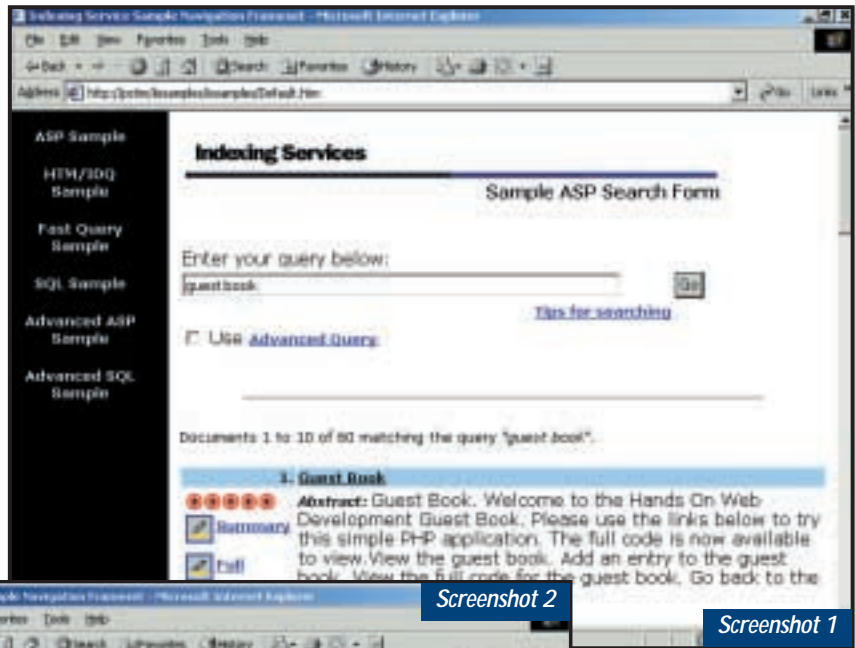
Searching for specifics

Tim Anderson checks out how to offer full-text searching with Windows 2000

The ultimate website navigation aid is full-text search, which allows the user to go directly to the right page in your site. If you have a large number of documents or reference material on your site, full-text search is the natural solution.

There are a number of full-text search engines available to web developers – some are open source and free to use, others are commercial. If you have Windows NT or 2000, you already have Index Server, which in Windows 2000 is renamed the Indexing Service. What follows is an explanation of how to use Indexing Service with Active Server Pages (ASPs) to add search facilities to a site. The Indexing Service runs on all versions of Windows 2000.

Before going any further, you will probably want to install the samples from the Platform SDK. This comes as part of the MSDN library, or you can download it from http://msdn.microsoft. com /developer/sdk/ platform.asp. Select the Indexing samples from the WinBase (Windows Base Services) category. Once downloaded, find the IISSearch directory and follow the instructions in the ReadMe.txt file to install them. Normally, this should be no trickier than running a batch file. You also need to ensure that the indexing service is running. The most convenient route to this is through the Computer Management snap-in, accessible from the Administrative Tools group on the Start menu. The Indexing Service is listed under Services and Applications. Right-click the top-level entry for Indexing Service, and click Start if it is not greyed out (indicating that it has already started). If the Indexing Service is not listed at all, run Windows Setup to install it.

Once the samples are successfully installed, you can open up a browser and navigate to http://localhost/ iissamples/issamples/Default.htm. Note that the sample application searches the catalog called web, which contains everything in the local default website. Screenshot 1 shows the ASP search form and results for a search for 'guest book', picking up the local copy of a website that is also posted to the Internet. Screenshot 2 shows the ASP advanced search form, which gives more options to narrow down the search. The implementation in the sample is fairly complete, offering extra features when results are returned. These include a confidence indicator in the form of a row of target icons that is meant to indicate how relevant the page is likely to be. There is also an automatically generated abstract, which takes some likely looking headings or paragraph openings from the document to give you a rough idea as to what the contents are. You can also compare the performance of searches using several different technologies, including ASP and IDQ/HTX. The latter stands for Internet Data Query/HTML Extension files, and it represents a more efficient method of accessing data dynamically using Internet Information Server. ASP is more flexible, because it allows custom processing of the results, whereas an HTX file is simply a template that presents all the results returned by Index Server. ASP is also easier to set up.

Index Server interface

The sample is useful, but doesn't quite match real-world needs. Here is how to

Screenshot 2

Screenshot 1

Above: The sample Indexing Service applications returns an impressive results page, including an abstract of each document
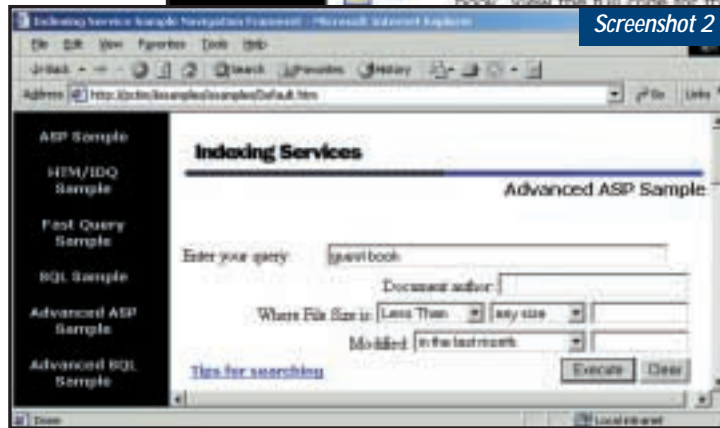
Left: Advanced searches can include restrictions based on size, date, author, or other properties

create your own search page. The first step is to define the catalog you want to use. You can think of a catalog as the actual index, and its location is where the index files are stored. This should not be confused with the location of the documents to be indexed. If you are indexing a site, make sure the catalog is not located within the website itself.

Once a catalog has been created, you specify which directories it will index. There are two distinct uses for the Indexing service. One is to index the file system on a network. For this purpose, you can specify the UNC (full network path) to each directory alongside the local path. The other function is to index a website. To do this, open the properties of a catalog, click the Tracking tab, and specify the virtual web server to be indexed. This action automatically adds the associated directories to the indexing list for that catalog. If you then double-click a directory you can choose whether or not to include it in the index. Note that when the Indexing Service is installed, it automatically sets up two catalogs, one for the default web server, and one for local hard disks.

If you want to narrow down the websites that are indexed, there are two options. At runtime, you can restrict the scope of a query to specified directories. You can also disable indexing completely on selected directories, by double-clicking directory and setting 'Include in index' to No. The best solution then may be to disable indexing on directories where indexing will never be required, and to stick with the default web catalog, narrowing the search as required at runtime. The Indexing Service is well behaved, unlike the Office FindFast add-on, but still imposes a system overhead and can use substantial amounts of memory and huge amounts of disk space. For example, on my small server the System catalog has indexed nearly 220,000 documents and occupies 244MB on the disk. That suggests keeping the number and scope of catalogs to the absolute minimum required. Catalogs are not limited to local documents – you can also index remote web servers and directories.

Query the index with ASP

It is also possible to set up a single ASP page to query the Indexing Service and present the results. Figure 1 shows the code. It consists of several elements.

This page may be displayed as a result of direct navigation (HTTP GET) or be called by submitting the form (HTTP POST). The behaviour differs accordingly, so in the header a script checks the request method, and if it is POST then the search value is read from the form. This also has the effect of persisting the value in the form, so that the user can easily see what search was entered even after the results come back. The form itself comes next, and in this example it is as simple as possible. The

user enters a value in the input box, and when the Submit button is clicked this gets posted back to the ASP page.

The code that follows is a simplified version of what is in the Indexing Service documentation. It uses two COM objects exposed by the Indexing Service, Query and Util. The Query object lets you define a query and then retrieve an ADO (ActiveX Data Objects) recordset, thus presenting a familiar model for manipulating and presenting the results. Key properties include Catalog, which

<table>
<tr><td>FIG 1</td><td colspan="2">Code for the Indexing Service ASP query</td></tr>
</table>

```
<%@ LANGUAGE="vbscript"%>
<html><head><title>✔
Indexing service query ✔
example</title>
<% Searchvalue = ""
    if Request.Server✔
Variables("REQUEST_METHOD") ✔
= "POST" then
        Searchvalue = ✔
Request.Form("Searchvalue")
        end if %>
</head>
<body>
<h3>Query index server with ✔
ASP</h3>

<p>Enter your query ✔
below.</p>
<form action="isquery.asp" ✔
method="post">
<p><input type="text" ✔
name="searchvalue" ✔
size="50" ✔
value="<%=searchvalue%>"/>
</p>
<p><input type="submit" ✔
name="dosearch" ✔
value="Query now"/></p>
</form>
<br/>

<% if searchvalue <> "" then
  set thisquery = ✔
Server.CreateObject✔
("ixsso.Query")
  set thisutil = ✔
Server.CreateObject✔
("ixsso.util")
  thisquery.catalog = "Web"
  thisquery.query = ✔
searchvalue
  thisquery.SortBy = ✔
"rank[d]"
  thisquery.Columns = ✔
```

```
"DocTitle, vpath, path, ✔
filename, size, write, ✔
characterization"
  thisquery.MaxRecords = 100
  thisutil.AddScopeToQuery ✔
thisquery, "e:\inetpub\✔
wwwroot\itwriting", "deep"

  set rs = thisquery.✔
CreateRecordSet✔
("nonsequential")
  activequery = true
  End if %>

<% if activequery then
    if not rs.eof then %>
    <h3>Query results</h3>

<% Do While Not rs.eof %>
    <p>
    <%if rs("DocTitle") = "" ✔
then%>
        <b><a ✔
href="<%=RS("vpath")%>"><%= ✔
rs("filename") %></a></b>
    <%else%>
        <b><a ✔
href="<%=RS("vpath")%>"><%= ✔
rs("DocTitle")%></a></b>
    <%end if%>
    </p>

<%  rs.MoveNext
    Loop %>

<% else  ' no records in ✔
query
Response.Write "No ✔
documents match the query<p>"
End if

End if 'no active query %>
</body></html>
```
(*Key: ✔ code string continues*)

Internet Explorer can be used as an edit control in VB

specifies which catalog is to be searched. Other essential properties include Columns, which lists the fields you want to return, MaxRecords, which lets you specify a limit to the number of results, and SortBy, which orders the recordset. In this example, the sort is by 'rank[d]', which means descending order of relevance. The Query property is where you state what you are looking for. In the example it is just the string entered by the user, but you can add further conditions such as the document extension. For the query property, use ISQL (Indexing Service Query Language), which unfortunately has two dialects because of incompatibilities between Index Server 1.0 and Indexing Services. The Indexing Service also supports an extended version of SQL, but to use this you need to use a slightly different approach, creating an ADODB.Recordset and treating it like any other ADO query. When ISQL is used, the Query object's CreateRecordset performs the query and returns a recordset with the results.

The Utility object has several methods for working with queries, of which the most important is probably AddScopeToQuery. By default, the query will search the whole catalog. As soon as you call AddScopeToQuery, it is limited to the scope you specify. Further calls to this method append additional scopes to the query. For instance, in the example in screenshot 1 the query is limited to the ITWriting website. This is done by using AddScopeToQuery with the path of the website. The 'deep' argument means subdirectories are included.

After calling CreateRecordset, the code loops through the result set, feeding values back to the browser. Because this is done in code, you could do further processing here. For instance, if this were a product search, you might want to highlight certain special offers in bold or in a different colour. The example also shows how to hot-link each result to the page in question by inspecting the 'vpath' field. This gives the virtual path to the document, as opposed to the path that returns the local path. The local path is not much use to web surfers and it is often something that webmasters prefer to keep secret for security reasons.

Paging results

The glaring problem with the code in figure 1 is that it does not handle paging of query results. There are various techniques for doing this, including saving active searches in session variables, or retrieving the previous last viewed record by some other technique such as a hidden field in a form. If the website is heavily used, storing searches in session variables is not good practice so other approaches should be used. Counting through a newly constructed recordset to recover your place is not totally reliable, especially if the website has been updated in the meantime, but that is probably a compromise worth making in most circumstances. The ideal scenario is to encourage users to narrow down their search enough for all the results to fit on one page. The ASP example in the SDK sample shows paging both with and without session variables.

Using IE as a control

For some time, it has been possible to use Internet Explorer as a control in other applications, for example those created with Visual Basic. Originally these custom browsers were read-only. With Internet Explorer 5.0, Microsoft introduced the DHTML Edit control; a browser-like control that adds editing features. The user can type into the control as if it were a web page editor, and you can then programmatically access the updated content, perhaps saving it to disk or back out to the web server via FTP.

With the release of Internet Explorer 5.5, Microsoft has declared the DHTML Edit control obsolete. Editing features are now part of Internet Explorer itself, and supported by the main browser control. Microsoft's documentation states that you can enable document editing, if you have IE 5, by putting a WebBrowser control on a form and using the following code:

```
set doc = ↵
WebBrowser1.Document
doc.DesignMode = "On"
```
          (*Key: ↵ code string continues*)

As pointed out by reader Michel Lambert, this does not appear to work. The reason is that you cannot address the document object in the control until a document has been loaded. Otherwise, the above code fails with "Object variable not set". To try out the editing feature of IE, proceed as follows. Open up a new VB project, add Microsoft Internet Controls to the component toolbox, and also set a reference to the Microsoft HTML Object Library, in the References dialog box. This allows you to add:

```
Dim doc as HTMLDocument
```
to the above code. Finally, in the Form_Load event handler, load something into the control like this:

```
WebBrowser1.Navigate ↵
"some_url_or_file"
```

You need to ensure the edit mode is not enabled until the document is fully loaded, for example using the Document Complete event handler. Now setting DesignMode works, and you can use embedded IE as a useful edit control.

CONTACTS

Tim Anderson welcomes your comments on the Web Development column. Contact him via the PCW editorial office or email:
webdev@pcw.co.uk
Examples from this column are posted at
www.itwriting.com/pcw.
For further information about the Indexing Service, see
http://msdn.microsoft.com/developer/sdk/platform.asp.
If the above was of no interest because your web server does not run on Windows, check out www.htdig.org for an open source search engine for Unix platforms.

Following the crowd

Nigel Whitfield looks at ways of tracking the clicks of your visitors as they navigate your site

In a recent issue of *PCW*, I looked at some of the dos and don'ts of web design. Of course, all the general points I made, such as making sure your site works across platforms, also apply to any ecommerce site. Do you really want to cut off the 10 per cent or so of your visitors who use a Macintosh, for example? Or the ones with a set-top browsing box who can't use Flash?

For a business site, there are some other issues that are worth looking at, too, especially when it comes to privacy, and so this month I'll be taking a break from looking at setting up shopping baskets to look at some of these issues.

If you have a large site, it's important to know just which parts of the site are actually working – that is, whether or not they're being visited and whether people are buying from them, or requesting information.

A simplistic argument says that as long as people are buying things, does it matter how they clicked to get to the order page – you're still receiving the money, after all. While that's certainly true, looking at your website in greater detail could pay dividends.

Do products featured on the home page, for example, consistently record more sales? Are accessories for a particular gizmo more likely to be read about and possibly ordered, if there are links on the page for the gizmo itself? Do sales links that are on product-support pages actually get used much, or would the screen space be better used for something else?

The answers to some of these questions might seem simple, but for some sites, it could be far from clear-cut. Being able to know the answers will let you tweak your site design so that you

can increase sales, or discard sales information that isn't working.

So, how do you get all this information? Your first thought may be to use the ordinary web server log, but you simply won't find accurate

Screenshot 1

Cookies help webmasters keep track of who is visiting their sites and are stored in the Cookies folder of your Windows directory. Visit a few sites and these mount up

information there. A typical log will record the IP address or host name that requested a page, the page requested and the date and time.

Analysis of the log usually works on the principle that several requests in succession from the same host are a session with a single browser. Even if that were true, you can't be sure that someone is following links from a particular page to reach another one. Everything falls over when requests come through a web cache, which results in different clients appearing to have the same IP address.

The solution, of course, is proper user tracking. And for those who haven't guessed, that really means the use of cookies that can ensure a unique ID is created for each visitor to your site, allowing you to see who is visiting which page and whether or not they're coming through a proxy server.

Cookies solve half the problem, but not all of it (screenshot 1). You'll know, even if they're coming via a shared IP address, that the person who visited the sales page is the same one who visited the product information page – but you won't necessarily know, unless you make

assumptions based on the order the pages are listed in the log file, whether or not they clicked the sales link from the home page, or from the product page.

To do that, you're going to need to use the http referrer information, which tells the server the page on which a link was clicked.

So, if you want to track users around the site, how do you do it? The simplest solution is to use a decent web server, such as Apache, that will handle everything for you, so that you can design an ordinary site, and still know who is following which links.
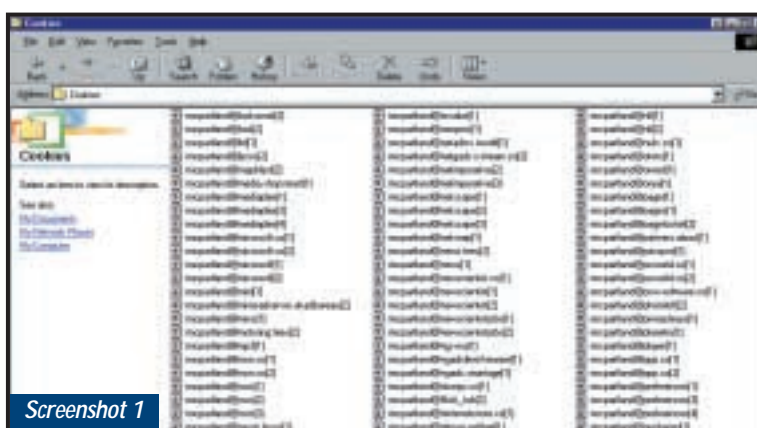
If you have a precompiled Apache server, then you need to use the command:

```
httpd -l
```

to list the modules that were compiled into the server (screenshot 2). The important one for the task in hand is:

```
mod_usertrack
```

Mod_usertrack is the module that tells Apache to create a cookie for each

Screenshot 2

Check that you have the right modules compiled into Apache

Cookies – the persistent question of privacy

Cookies are a contentious topic, especially when it comes to privacy on the Internet. It's hardly surprising – many web agencies have used them to build profiles of users across the Internet rather than just within a site. The issue is blurred even further by the fact that very few sites have a clear policy when it comes to cookies. Even if they do, by the time you've read the relevant page, you've probably already got a piece of code squirrelled away on your hard drive.

It's also not surprising that there are so many programs available to help users rid themselves of unsolicited cookies altogether. Take the shareware program, Complete Cleanup! as an example. This can be downloaded from: **www.softdd.com/complete/ index.htm**.

And, of course, many people choose not to accept cookies at all when configuring their browser settings.

Nevertheless, if you want to track users around your site on the web, then there isn't really another way to do it accurately so you'll have to use cookies. While you could leave your visitors guessing as to your intentions, to observe the best netiquette, you really need to address people's concerns about privacy.

Of course, your site should have a clear privacy policy anyway, but I think it's worth bearing these specific points in mind if you're using cookies:

● Don't design your site so that people can't buy anything from you when they have cookies turned off. As well as limiting your potential profit margins it's also likely to annoy. Imagine getting all the way to the 'checkout' only to be told you can't buy anything! It's very important, if you use your own scripts, to ensure they work when they can't read cookies, or appear to receive out-of-date information.

● The most unobtrusive way of using cookies is to use 'session cookies'. Session cookies expire when the web browser is closed. This means that the next time the browser is fired up, it will have no record of your site whatsoever.

Remember, some users may have altered their Internet settings to allow them to accept session cookies, but not persistent ones.

● It's best to only use persistent cookies if you really have to. This is where your privacy page comes into its own. You might tell people, for example, that if they want you to record their name and address, then they'll have to have a cookie stored on their computer. It's important to make sure you explain clearly the cookies policy of your site to allay any concerns that visitors may have. Remember, at best cookies are a way of getting your site to work for the benefit of both you and your visitors.

user; it has only two directives, one to turn cookies on and the other to set their expiry date. I recommend that you don't set an expiry – that way Apache will simply create session cookies instead.

As well as enabling the generation of cookies, you also need to log them, which is done using Apache's CustomLog directive, including:

`%{cookie}n`

in the log definition you'll also need to log the referring page, which is in the referrer header of an http request.

Using the CustomLog, you can include the referrer information, with the

`%{Referer}i`

definition. Screenshot 3 shows a configuration for a virtual server recording the cookies and the referrer for requests, separately from the

main access file, in the last two lines of the configuration section.

Remember that mod_usertrack isn't compiled into Apache by default, although it is part of the standard distribution. That means you might need to rebuild the server. Once that's done, and the configuration file is updated, restart the server and you'll see all the clicks logged in the file (screenshot 4).

On each line you'll see the cookie, which includes the IP address of the client, then the referring page and finally the file requested. Looking at this log shows that the more recent visitor, for example, viewed a picture of my car, then followed the link from that page to the picture of me, rather than going directly to me from the home page.

Analysing this information certainly isn't trivial, but if you're serious about building a website that works for you and your customers, it's well worth the effort to find out which route people take through your site.

Screenshot 3

Above: Adding CookieTracking and CustomLog directives to Apache will help you see how people are using your site Right: User cookies and referrers help you see how people moved through your site
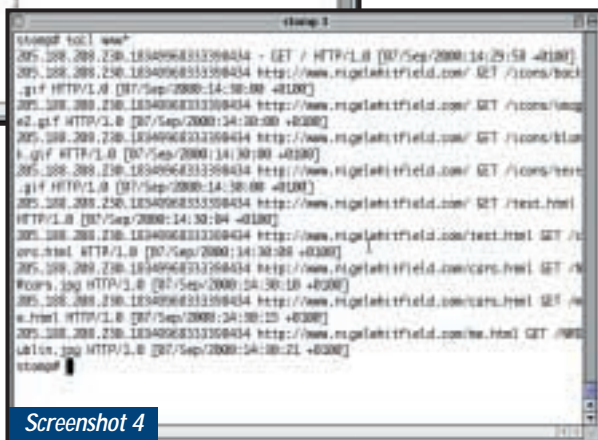
Screenshot 4

The next generation

With two new phones utilising GPRS and HSCSD, Simon Rockman takes a tour of the protocols

Two very important phones are about to hit the shops: the Nokia 6210 and the Motorola Timeport P7389i. The Nokia is a slimmer, lighter version of the popular 6150 and is the first phone to support HSCSD. Motorola's new offering is a variation of the P7389 tri-band WAP phone and will be the first to use GPRS.

HSCSD stands for High Speed Circuit Switched Data and GPRS means General Packet Radio System. Both technologies offer higher-speed mobile access. The access speed is best described as 'higher' rather than 'high' because while fixed-line modems boast 33.6Kbits/sec, mobile phones offer just 9.6Kbits/sec. In theory, HSCSD allows speeds of up to 115.2Kbits/sec, while GPRS offers up to 171Kbits/sec. In reality, you'll find the Nokia running at 28.8Kbits/sec and the Motorola at 19.2Kbits/sec. Both figures should be read as 'up to' and 'plus compression', but this depends on the data you are sending, where it is being sent from and how busy the cells are.

Orange, one of the few networks to have installed HSCSD, sees it as a premium service to be offered in addition to GPRS. BT Cellnet, meanwhile, sees HSCSD as a halfway house. This is because GPRS is already available to some corporates and will be on sale before HSCSD.

The truth is that they're each suited to different things. To compare the two systems, you need to understand how the GSM phone system works. Unlike a landline call where your voice is the only one on the line, with GSM you share a radio frequency with up to seven others who take it in turns to use the line. A gap between turns and error correction ensures that conversations don't get intermingled. As you only have an eighth of the available time, the phone's CODEC (compression/decompression circuit) compresses your speech. Using Time Division Multiple Access (TDMA) it then transmits the high-speed recording when it's your turn but, unfortunately, you only get one slot, even if the rest of the cells are empty.

The Nokia 6210 (above) offers faster Internet access using HSCSD, while the Motorola P7389i (right) uses GPRS to browse the web

Speeds are limited under TDMA. The need to stop the adjacent slots interfering with each other is complicated by the signals bouncing off obstructions, such as buildings. To make sure data doesn't get scrambled, extra error-checking information is sent. Even phone engineers admit you rarely need the high level of protection it affords. It's a bit like putting bubble wrap inside a Jiffy bag – take out the bubble wrap and you can send a bigger parcel. In this case, it's a 14.4Kbits/sec connection. When conditions dictate, the system puts in the extra padding and the speed drops back down to 9.6Kbits/sec.

HSCSD is effectively like having two phone lines and uses two or more slots.

Two 9.6Kbits/sec slots translate to 19.2Kbits/sec, and two 14.4Kbits/sec slots to 28.8Kbits/sec. The system dynamically switches between speeds depending on the signal availability. When you use HSCSD it costs the network twice as much to handle your call, but Orange will charge the same for a 28.8Kbits/sec call as it does for any other. The service costs an extra £5 a month. This is fine if you use a 28.8Kbits/sec connection, but if you want to use 14.4Kbits/sec rather than 9.6Kbits/sec (with Nokia's 7110 or Samsung's A100), you'll still have to cough up the money.

Connection speed is usually the same in both directions. A phone uses slightly different radio frequencies for receiving and transmitting. Orange's implementation of HSCSD uses two channels in each direction, but that's not how people tend to use data. If you're looking at a website, you enter a tiny amount of data (eg a URL) and get back a huge amount of data. To cater for this, there is an asynchronous standard. Rather than have two channels in each direction – 'two up, two down' – you could have one channel for transmitting and three for receiving – 'one up, three down'. This gives 9.6Kbits/sec to send the URL and three times 14.4Kbits/sec (some 43.2Kbits/sec) to receive the page.

A 56K modem on a landline doesn't really work at 56Kbits/sec. It's asynchronous, in this case 33.6Kbits/sec up and a maximum of 56Kbits/sec down, although the rate is more typically 40Kbits/sec down. The 115.2Kbits/sec comes from eight slots at 14.4Kbits/sec. Unfortunately, anything better than 28.8Kbits/sec requires more network engineering, so it's simply not viable. When Orange is handling one two-slot call it could be handling two voice calls, but part of the rationale behind offering HSCSD is that the kind of people who use it also have huge voice bills. A German network does offer 43.2Kbits/sec, so theoretically it could offer three up, two down (tying up eight system slots). However, Orange wants HSCSD for its videophone (which sends

HSCSD technology enables the Nokia 6210 to transmit and receive data at higher speeds than older mobile phones

and receives data in equal measure), so two up, two down is the best option.

The Nokia 6210 isn't the first HSCSD device, that award goes to the Nokia Cardphone 2.0, a PC Card with a built-in phone. However, the 6210 is the first HSCSD handset. It looks like other phones in the 6000 series (and uses the same accessories), but is slimmer and includes features found on the 7110. The unit measures 129.5 x 47.3 x 18.8mm (h x w x d) and the standard 900mAh lithium-polymer battery gives between 2.5 and 4.5 hours of talktime, with up to 10 days on standby. On pre-production units, the screen looks good and has a resolution of 96 x 60pixels, a shade smaller than the 7110's 96 x 65pixels. This could lead to WAP formatting problems, as many sites are designed for the 7110.

Voice recognition has been available on phones for a couple of years and the 6210 is the first Nokia handset to come with voice dialling. It will store 10 phonebook numbers, but won't respond to commands to switch menus like a Motorola. The unit boasts a calendar function with a 220-entry capacity and, like the 7110, the handset allows you to store multiple phone numbers and text

against each name. The phone also features T9 predictive text input and there's an internal antenna, vibra alert and ascending ring tones that can be downloaded.

HSCSD is supported at 19.2, 28.8 and 43.2Kbits/sec. This works with the built-in WAP 1.1 browser and, when using a serial cable or infra-red to connect, the PC Suite program makes it easy to transfer data between the phone and a PC. Battery life is an important consideration with an HSCSD phone, as when the phone uses two channels, talktime will be almost halved. However, predicting battery life is even harder than

The Motorola Timeport P7389i is supplied with a GPRS connection wizard that will configure your system and phone for Internet access

predicting line speed, as it switches between 9.6, 19.2 and 28.8Kbits/sec in each direction. Luckily, the 6110 has a huge selection of batteries, including a 15,000mAh lithium-ion battery.

Compared to HSCSD, GPRS is a much cleverer system, which could deliver even higher speeds. The important thing to remember about GPRS is that it is a packet-based system. Rather than having a GSM slot to yourself, you share one. Data doesn't fill the slot – instead it shares space with others. This will be slower than 9.6Kbits/sec, but GPRS is

efficient and lets you use as many unused slots as are available. If the slots are adjacent, you don't need a time gap to separate the information. In theory, GPRS is capable of 171Kbits/sec. In practice, you don't get all eight slots and the overhead of sharing cuts this down substantially, but 40Kbits/sec is a good working figure. Like ADSL, GPRS is always connected. If someone sends you an email and you have a GPRS phone, the email should pop up straight away. You can also make voice calls at the same time as downloading data.

The Motorola P7389 is a widely available handset offering circuit-switched connection for WAP and an infra-red connection to a notebook or PDA. The P7389i is the GPRS version of this phone. BT Cellnet is about six months ahead of its competitors in launching GPRS and has been criticised for launching too early. There are problems, not least that coverage is still being rolled out. For example, there is no coverage in central London and anywhere north of Milton Keynes. Nevertheless, it is hugely impressive that anything is shipping at all.

The P7389i has infra-red support which can be used with a laptop or PDA. It's supplied with the Motorola GPRS connection wizard to configure your system and phone. This allows the connection to tunnel through the BT Cellnet bearer service to the system you want to connect to. For most people this will be general Internet access, web browsing and the ability to read mail.

The Timeport P7389i may be the first GPRS phone, but Ericsson has also announced the T36 (two down, one up) and the R520 (four down, one up). In six months' time, mobile data will have caught up with modems, although by then the cable companies and BT might have sorted out cable modems and ADSL. A cable modem is, in theory capable of 30,000Kbits/sec and ADSL will run at 8,000Kbits/sec. In practice both will tend to run at 512Kbits/sec, but that's still 10 times the speed of today's fixed lines and tomorrow's mobiles.

CONTACTS

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SoHo hook-up or hiccup?

Roger Gann continues his guide on the best way for small networks to access the Internet

Last month, I looked at the practicalities of hooking up a small or branch office network to the Internet. I examined the various ways to connect; using modem sharing, a proxy server and a router. I also looked at ISDN routers and the advantages they enjoy over straight terminal adaptors (TAs).

In this month's column, I'll explain what to look for when buying a router and illustrate why ADSL isn't necessarily the best choice for small businesses.

Choosing a router

There are a number of factors to consider when choosing a SoHo (small office home office) router. Factors such as ease of installation, configuration and use are very important, and most units generally meet these criteria.

Analog phone support is essential in the branch office scenario. Most routers will offer these bandwidth management features: dial-on-demand, bandwidth-on-demand and multi-link PPP. Bandwidth-on-demand is when the usage level of the first ISDN B channel exceeds a certain percentage and the second B channel is brought up. With both channels up, you are using multi-link PPP. Multilink PPP aggregates the bandwidth of the two B channels into a single, logical 128Kbits/sec channel.

Then there are the IP management features. Most routers will offer dynamic host configuration protocol (DHCP), which simplifies allocation of TCP/IP addresses considerably, although this is not really an issue for small branch offices. Most will work with static IP addressing so you can define your own Class-C network and ignore DHCP altogether.

Network address translation (NAT) is also important. Not only does it let more than one PC share a single dial-up ISP connection, it also acts as a simple firewall. Another desirable feature is port address translation (PAT). This works alongside NAT but handles different services. PAT maps TCP and UDP-based applications, such as Microsoft's NetMeeting and White Pine's CU-SeeMe, through the router. However, not all implementations of PAT are alike and many routers only offer limited PAT support.

Another (albeit uncommon) feature on routers at this end of the market is tariff management; that is, the ability to monitor and control call charges, which could get out of hand when using ISDN. Typically, this feature can limit the dialling window to just a few hours per day and then enforce a ceiling on the maximum number of calls. But tariff management is less important with the advent of unmetered calls.

Other not-so-critical features in these routers are support for IPX as well as IP and DNS proxying so that DNS queries are passed out to the DNS server. Most routers work with different authentication protocols, such as password authentication protocol (PAP) and challenge handshake authentication protocol (CHAP) for securing your dial-up session. Support for STAC compression is also important.

The case for ISDN

BRI comprises two 64Kbits/sec Bearer or B channels, which can be combined or aggregated for a maximum capacity of 128Kbits/sec without compression, roughly four times the capacity of a V.34 modem. An ISDN 2e line comes into your premises terminated by a wall socket with two RJ45 sockets and not the more familiar single BT600 phone socket.

You can only connect ISDN equipment directly to an ISDN line. However, if your ISDN device – the router, for example – has analog ports, you can plug your phones or fax in here and use them in the normal way. Using a facility called multiple subscriber number, separate analog phone numbers can be assigned to the analog ports on your ISDN device. This gives you, in effect, a pair of analog phone lines with ISDN 2e.

Each B channel is equivalent to a

ISDN in the shape of Business Highway can give ADSL a run for its money — and it can be a third of the price

phone line and you can dice the ISDN connection just about any way you choose – two separate ISDN channels or one aggregated ISDN channel, or two analog lines or an analog line plus one ISDN channel. Most ISDN devices offer dynamic bandwidth allocation, which will drop one ISDN channel if both are being used when an incoming analog call is detected.

While it can only deliver about 20 per cent more bandwidth – 64Kbits/sec as opposed to the 56Kbits/sec of a V.90 modem when used with a standard ISP dial-up account – ISDN has other attractive features. Call setup times are in the order of a couple of seconds, not the 30-plus seconds it takes with a modem, although the new crop of V.92 modems promise to roughly halve this time. This is important because rapid connection times, coupled with on-demand dialling, gives the illusion of a permanent network connection.

Importantly, bandwidth is guaranteed – you always get 64Kbits/sec, a predictability that is alien to analog connections. On top of this, it is possible to aggregate the two 64Kbits/sec B channels to form a single 128Kbits/sec connection. While many ISPs don't give you aggregation for dial-up accounts, it

is available for more expensive business accounts. If you're connecting to the corporate LAN directly, then there's nothing to stop you using aggregation. The call will cost twice as much, but it'll only last half as long.

ISDN vs ADSL

What about ADSL? Isn't it at least four times faster than ISDN? Wouldn't that be a better choice for the small office network? Yes, it might. But I would argue that for small business use, it doesn't offer as many advantages as it might first appear to.

Firstly, ADSL only offers you one connection – to your ISP. Many branch offices also need to connect to head office networks, so ISDN is a good solution as it offers a direct, point-to-point connection. ADSL users can't make point-to-point connections and so would have to access the head office network via the (wide open) Internet. And if they wanted security, they'd have to use a virtual private network (VPN). As a result, throughput would be unpredictable and dependent on prevailing traffic levels.

Reliability is another issue, and I have my doubts about being an early adopter, certainly from a business standpoint. We only have to look at Gordon Laing's recent 'ADSL hell' experience (*PCW* October 2000) to know that BT's

expertise in this area isn't extensive. At least it does know how to fix faults with ISDN lines, a relatively mature and stable technology. I'd like to give ADSL a bit longer to settle down before running a business over it. In a year's time it'll probably be cheaper too.

I reckon ADSL is over-priced and, as far as businesses are concerned, it isn't as big a bargain as the domestic version. It offers precisely the same bandwidth, albeit with a reduced connection ratio, for two-and-a-half times the cost – £100 as opposed to £40 per month. To be fair, ISDN 2e isn't a particularly cheap solution either. A single user, like myself, can easily rack up call charges of £150 or more per month. But times change.

Just recently, I've been able to slash my ISDN 2e bill dramatically, to about £55 per month. I've done this by taking up one of the 'tenner-a-month' unmetered access offers from one of the ISPs, in my case good ol' Freeserve.

OK, I can only use one of my two 64Kbits/sec ISDN channels, but at this price I ain't complaining.

For ordinary SoHo use (three or four users maximum), this bandwidth would be adequate – I know of several web design agencies that make do with 64Kbits/sec leased lines. This speed is just fine for email, and so what if the live feeds from the Big Brother website were a bit slow?

So, the monthly cost of ISDN is roughly half that of Business ADSL? No, it's even greater. This is because any office would need a minimum of two voice lines – one for voice and one for fax. So the rental of these two lines, currently £12.73 each per month plus VAT, needs to be added to the ADSL bill of £100 per month, making a
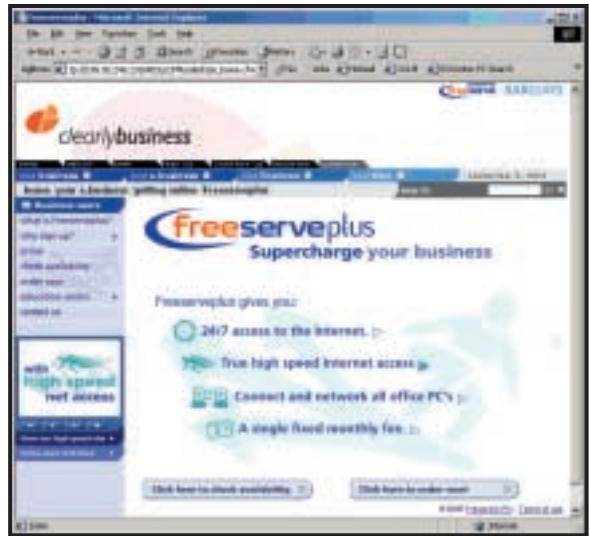
BT isn't the only telco in town to offer ADSL. Other ISPs, including Freeserve, are offering it, but ADSL may not actually be the best choice for small businesses

total of about £125 per month for ADSL plus two business lines.

Let's contrast this with the ISDN alternative. I use BT ISDN 2e, but there is a cheaper alternative, BT Business Highway, which, when coupled with the discounts available through schemes such as BT Together, becomes a tempting proposition indeed. Conversion to Business Highway is currently £49.50 and the monthly rental is £46.99, which includes a £20 call allowance. So, adding all the deals together, you could have two business lines, which double as your unmetered digital Internet connection, for about £37 per month – that's about a third of the cost of a similar ADSL setup.

But there are a couple of minor flaws here. First, direct calls to your head office network would still attract call charges, unless you used VPN. Second, some thought would have to be devoted to dealing with email. A branch office could simply collect its mail from the head office server over the wire, but a small business would probably need to install a full-blown (but basic) mail server, such as SLMail, to deliver mail to each individual's desktop.

You'll still need to run a proper email service at the branch office. SLMail, from Seattle Lab, is an easy-to-use, reliable email server

CONTACTS

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networks@pcw.co.uk

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GET A FULL SPEC OF THE MACHINE

Before you place an order for a machine, insist on being faxed or emailed a full specification, detailing all components and peripherals. Check what is included: for example, when buying a printer, are all cables and cartridges bundled? If you've used a review in a magazine to guide your decision, make sure that what is quoted matches what you have read. Sometimes, machine specifications can change from the model sent for review.

BE CLEAR ABOUT SUPPORT AND WARRANTIES

Make sure that you get a warranty that suits your needs and is fully detailed in the quotation. If you need swift repairs, consider paying extra for an eight-hour repair service. Also make sure you understand the level of service you can expect to receive, including who pays for couriers if your machine has to be returned for repair.

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SET DELIVERY DATE AND CHECK WHAT IS DELIVERED

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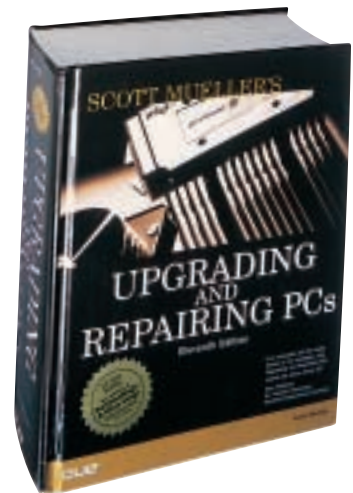
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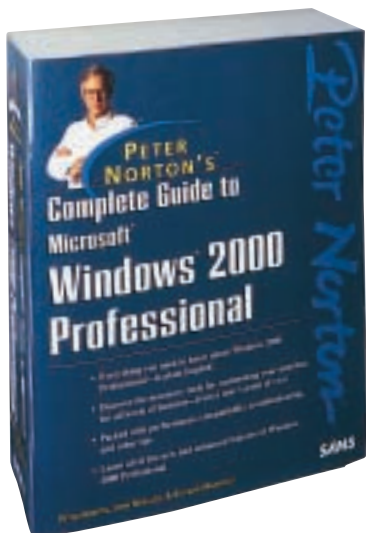
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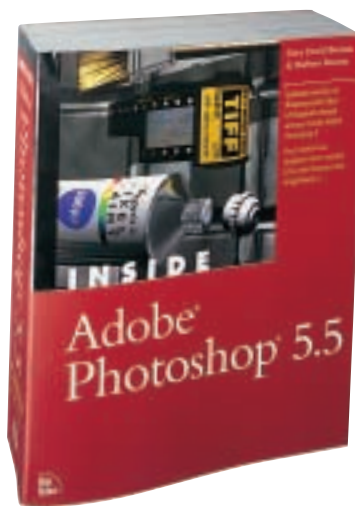
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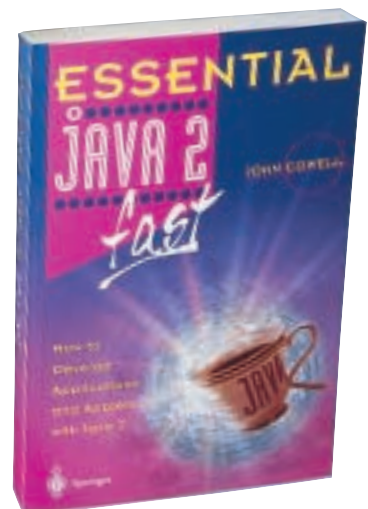
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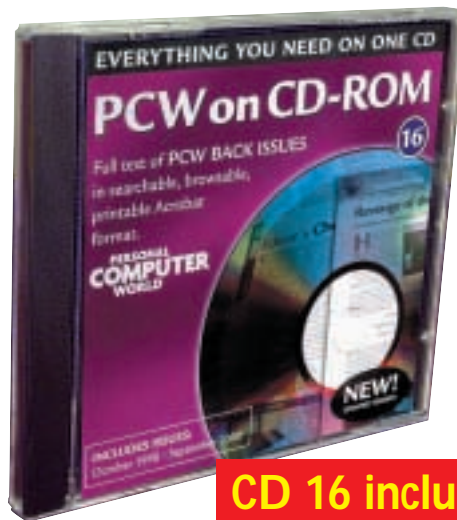**PCW subscriber price £13.45**

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LEISURE LINES

contents

Mafia

Did you ever fancy yourself as a 1930s gangster? Well soon you'll be able to play out your Al Capone fantasies in a title to under development by the team at Illusion Softworks – the people who brought the world Hidden & Dangerous. Mafia, to be published by Take 2, is a gangster game like nothing you'll have seen before. As with H&D, a full 3D environment has been recreated allowing freedom of movement of your characters, although unlike H&D, Mafia allows you freedom of a whole city, rather than an area specific to a given mission.

The city, called Lost Heaven, covers an area of 12 square miles and exists in its entirety for every mission. What this means is that you are not locked into a smallish area to complete a mission, although there are obvious implications for getting lost while doing a mission. The city is filled with people and over 60 types vehicles, all of which will be drivable. The cars will also boast the most realistic physics ever seen in a game – quite a statement when you consider some of the driving games around these days. Not only will they drive realistically, but also they must be driven legally if you are not to attract the law.

You play the part of Tommy, a Mafia gangster who decides to get involved in a bit of on-the-side work. The decision to do this leads to untold problems both with other gangsters and with the Police (who patrol the city ensuring laws are adhered to).

The game takes the form of 20 single-player missions that span a 10-year period and make up the backbone of the game. But with multiplayer options available too, this game has all the makings of a classic.
www.mafia-game.com/

SCOTT MONTGOMERY

Cultures

Cultures is a management sim with all the hallmarks of a very addictive game that will have you glued to your PC. In the popular genre of 'god' sims, Cultures involves management of a community of Vikings who are on a quest to find six parts of a comet, a quest that takes them to the shores of the US. The graphics have a similar look to Goscini and Uderzo's *Asterix the Gaul* stories, and each character has its own unique personality. This means the game is not only visually appealing, but it also displays the level of depth sim managers will be craving.

The game involves you helping the colonists to build a settlement, as well as getting them ready to venture inland to complete their quest. Only through finding the parts of the comet, which they think has been sent as a sign from the gods, can the harmony of the community be achieved. All aspects of the people's lives need to be looked after, from day-to-day tasks to bringing up the children.

With the colony set up, further villages can be built and trade entered into with the natives. The game does not therefore rely solely on warfare as diplomacy is also strongly relevant.

With each character being unique, it is important to know who is who and the talents and attributes they possess so that you can organise them towards the end goals. If you liked The Sims, you'll like Cultures.

Developer THQ expects to have the game completed for release in the near future. However, for now you'll have to be satisfied with downloading the demo at http://www.demo-files.com.

SCOTT MONTGOMERY

Star Trek: Elite Force

The first-person shooter enthusiast will enjoy this game as much as your die-hard Star Trek fan

You're walking through an alien ship with two of your Elite Force companions when one of them suddenly decides they are going to take 'point'. Your stomach knots as you watch her stride ahead, knowing full well that in true *Star Trek* fashion she won't be coming back. And as sure as night follows day, within moments the aforesaid heroine is vaporised to such an extent that your companion's tricorder can't even pick up residual traces of her body. Truly *Star Trek* stuff, and you're in the thick of it in this Quake III Arena engine-driven, first-person shooter developed by Raven Software (Soldier of Fortune) and published by Activision.

The game takes the form of episode-style missions, and there's even a title sequence after you've played through the first mission to give you that all-round TV feel. All the *Voyager* crew are there from Chakotay to ex-Borg Seven-of-Nine, and the original *Voyager* actors even do the voices.

In first-person shooter terms, Elite Force is excellent. With 40 single-player levels and 12 multiplayer deathmatch arenas (which can be played in single-player mode against bots of various skill levels or online), the first-person shooter enthusiast should glean as much from the game as the Star Trek fan. The game has it all: a strong story, lots of action and an exceptional representation of the *Star Trek* universe.

Using the Quake III Arena engine has allowed an ultra-realistic Voyager to be created, with all the rooms familiar to fans of the series. The Infirmary, the Bridge, the Captain's Ready Room and the Engineering section are all meticulously recreated. As for sound, all the beeps from doors to computer panels help to make the Voyager of the game as convincing as possible.

There is a good variety of weapons for use in the missions – considering the tendency to use just phasers in *Star Trek*. The most basic weapon is a hand-held phaser, while for a bit more of a punch there is the phaser rifle, which easily vaporises most opponents in a spectacular orange echoey screaming fashion with a single shot. More

outlandish weapons include the Infinity Modulator, which constantly changes the frequency of its laser so the Borg can never adapt to it; the Scavenger Gun, a kind of laser gattling gun with a bomb launching alternate fire; and an arc welder, which leaves your enemies fizzling in a blue sparking mess! Very cool weapons.

As for your opponents, all the main adversaries from the series make an appearance. These include the Malon, Hirogen Hunters, the dreaded species 8472 and the scourge of the Delta quadrant, the Borg.

Elite Force manages to attain a level of gameplay that will thrill fans of games like Half-Life, as well as die-hard *Star Trek* fans. With non-player characters discussing events and talking to you, the game environment is extremely interactive; and the

inclusion of cut scenes further adds to the overall feel.

Controls for the game are similar to any first-person shooter, with the mouse controlling movement of your view, and keyboard keys dealing with other actions. As with Half-Life, there is the need for a 'Use' key to allow you to manipulate objects in the game environment.

Learning the basics of the game is covered in a holo-deck training session with Tuvok, the Vulcan security officer from *Voyager*. In this tutorial, holographic environments are generated to allow you to get up to speed with movement and shooting requirements. The holo-deck also features when new weapons become available for use in missions, with a trip to a holo-environment complete with baddies for you to discharge the new weapon on.

Star Trek Elite Force is one of the best first-person games for a long time. With events never recurring in exactly the same way, even replaying after being killed is interesting. If you are into first-person shooters with an excellent single-player option and a story that will have you gripped for some time, this game should not be missed. Overall, an excellent title.

SCOTT MONTGOMERY

DETAILS
★★★★★

PRICE £29.99 inc VAT
CONTACT Activision 01895 456 700
www.ravensoft.com/eliteforce/
SYSTEM REQUIREMENTS Pentium II 233MHz, 64MB of RAM, Direct X 7.0a-compatible graphics card, 650MB of hard disk space plus 64MB additional for Windows swap file, Windows 95/98/2000/NT4-SP5

RECOMMENDED
Personal
COMPUTER
WORLD

Crimson Skies

The graphics in this stylish game are nothing short of spectacular

I n an alternate reality, the 'good old US of A' doesn't survive the Wall Street Crash of 1929. Instead, the individual states secede from the US and form self-governing regions. Along with this collapse of the country comes mass desertion from the military as people swear allegiance to their native states. This causes turmoil, with rival militias skirmishing along the borders. The road and rail systems fall into disrepair or are destroyed leaving air travel the preferred mode of transport. Massive Zeppelins command the sky lanes, while small, highly manoeuvrable aircraft (loosely based on World War II warbirds) become the weapons of war for both the militias and a new thriving industry that has emerged – air piracy.

One hero of this new industry is Nathan Zachary. He is dashing, debonair and he's also the guy you play in this magnificent title from Microsoft. Zachary has all that a pirate needs to ply his trade, loyal followers, his own Zeppelin (the Pandora), and the wit and charm to complement the heroic soundtrack that accompanies the game.

Set in the 1930s, this is a game of heroes, aces, rogues and planes – all crammed into 20 single-player missions. You begin with only one aircraft type – a plane with the wings and propeller in the rear and the control surfaces at the front (basically a back-to-front plane). Within a couple of missions, though, you begin to steal and buy new planes for use in future

missions, and if you get enough money together you can have your own built.

There are three views for playing the game (along with a flyby view, which is there to allow you to see how stylish the planes are). First, there is the in-cockpit view, which takes the form of a virtual cockpit that moves in relation to your manoeuvres. Second, there is a third-person view, which lets you see the damage to your plane (you are basically hovering above and behind your plane). This is certainly a spectacular viewpoint, and with the flight instruments set up as dials up the side of the screen, you know what's going on too. The final view has no cockpit or third-person view, but still has the dials – ideal for those who like to be able to see as much of what's going on as possible. The missions are fun and enjoyable, although the game defaults to normal difficulty, with hard and hardest being the only other options. At normal it is a little too easy to complete early missions, so we'd suggest setting it to hard (medium) to ensure you don't just buzz through the first half a dozen missions. Mission objectives involve stealing planes, destroying Zeppelins, and a lot of dog-fighting.

The missions follow a fairly set pattern, with a briefing followed by plane selection and weapons load-out, then a brief intro cut-scene (which can be skipped), then you're dropped out the bottom of your Zeppelin and you're off.

The graphics in this game are nothing

short of spectacular. Flying up and through the clouds you eventually break out into clear blue skies with real-looking 3D clouds around you. Explosions are superb, with enemy planes spewing blazing trails of fiery smoke as you pump .50 calibre slugs into them. Missile explosions are also excellent; whether they are simple explosive rockets, flack missiles or anti-Zeppelin torpedoes. As you can imagine, this all needs a pretty powerful beast to get the most from the graphics. But if you have a medium spec machine you should be able to get it working well enough to be amazed at the spectacular destruction of huge airships.

Somewhere between a simulation and an arcade game, Crimson Skies involves some of the most fun flying from an airborne game set pre-World War II. If you enjoy propeller-driven combat flying games then you'll enjoy this one.

SCOTT MONTGOMERY

DETAILS

★★★★★

PRICE £29.99 inc VAT
CONTACT Microsoft 0345 002 000
www.microsoft.com/games/crimsonskies/
SYSTEM REQUIREMENTS Pentium II 266MHz, 64MB of RAM, Direct X 7.0a-compatible 8MB video card graphics card, 675MB of hard disk space plus 250MB additional for Windows swap file, Windows 95/98

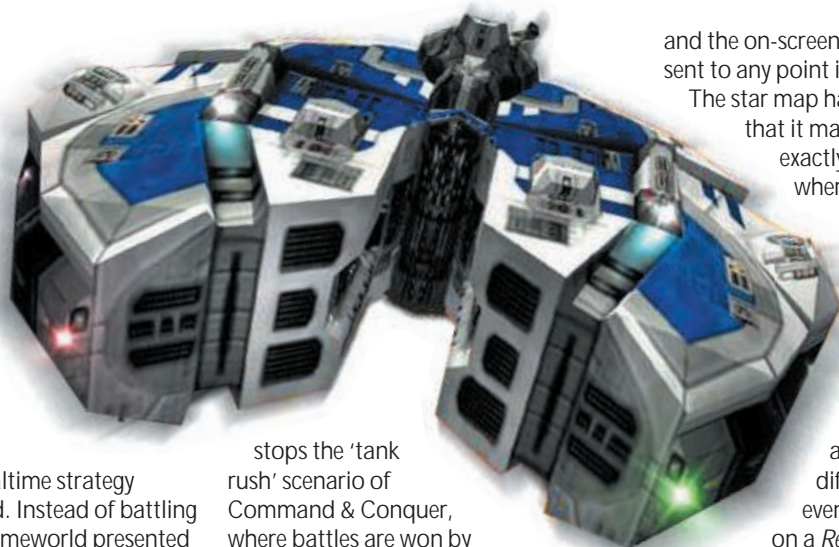RECOMMENDED
PERSONAL COMPUTER WORLD

Homeworld Cataclysm

With some of the best visuals to hit the PC, here's your chance to fight the great space battles

Starfleet versus the Borg, the Rebels versus the Empire – both great space battles that we've all wanted to orchestrate. With Homeworld: Cataclysm you'll get your chance.

The game is, of course, the sequel to the hugely popular Homeworld, which redefined the way realtime strategy games were perceived. Instead of battling over a small field, Homeworld presented an entire universe in which to fight, including a true 3D environment. With Cataclysm, this basic premise has been taken and tweaked. Fortunately, the changes are mostly in how the game plays, leaving the gorgeous graphics as they were. While graphics don't make a good game, they surely help, and Cataclysm displays some of the best visuals to hit the PC.

All of the ships are beautifully rendered, and hold their detail as the camera zooms all the way in. Zoom out, and as they become dots, the sheer size of space becomes apparent. Where Cataclysm really triumphs, though, is in the actual game itself. Set 15 years after the original Homeworld story, you take command of the Kith Somtaaw and its deep-space mining facility. After answering a distress call, the new threat – a technologically advanced virus called the Beast – rears its ugly head, and the fight is on. Launching into the game, the differences between this and the original start to appear. Most obvious is the Mothership (now called the Command Ship), which is capable of movement. During missions, the ability to move the Command Ship closer to the conflict can often mean the difference between victory and defeat.

If you're thinking that this just makes the game easier, think again. Cataclysm also introduces the idea of supply points for ships. The tougher the ship the more supply it takes. If you don't have the supply chain to support your fleet, you can't build more ships. This immediately stops the 'tank rush' scenario of Command & Conquer, where battles are won by building hundreds of the same vehicles and swamping the enemy.

Additionally, another problem comes from the way the Beast fights. Being a virus, it literally infects your craft and subverts it to its own evil needs. This has two effects on your mission: first, you lose ships; and second, the Beast gains ships. As the Beast gets stronger while you get weaker, clever tactics are the only way to win the game. If there is one downside to this, it's that missions can get very difficult. Fortunately, the control system is up to the job. While the 3D environment of space may initially seem like a nightmare to navigate, Cataclysm passes the grade with flying colours. Through a combination of the star map and the on-screen display, ships can be sent to any point in the galaxy with ease. The star map has the added bonus that it makes it easy to see exactly what's going on, where your ships are, and where the enemy is. On top of simple movement, the keyboard is used to assign special functions to craft. For example, you can group the attack craft together in different formations, or even cause one to embark on a *Return of the Jedi*-inspired Kamikaze run.

You're better off not using this too much though, as ships improve with the number of kills that they make. Luckily this never gets out of hand with one super-fighter that's indestructible.

If you get bored of the 17 single-player missions, then the multiplayer option from the original is intact. Nothing has really changed, except the choice of sides now comes down to either the Kith Somtaaw or the Beast. However, with the additional controls, and abilities of the two sides there's enough here to give the multiplayer aspect a breath of fresh air.

Overall, Cataclysm may lose out slightly to its predecessor when it comes to the cinematic interludes, but in every other aspect, it's a clear winner. The mission structure has been hugely improved, and the gameplay has been filled out. If you're looking for a challenge, this is the game to buy.

There's not a lot else we can say, besides we've got a universe to save!

DAVID LUDLOW

DETAILS

★★★★★

RECOMMENDED
PERSONAL COMPUTER WORLD

PRICE £34.99 inc VAT
CONTACT Havas Interactive 0118 920 9100
www.sierra-online.co.uk
SYSTEM REQUIREMENTS Pentium II 233 (Pentium II 350 recommended), 32MB of RAM (64MB recommended), 210MB of disk space, 4MB graphics card

Age of Empires II: The Conquerors Expansion

This addition to a venerable title does exactly what it should and builds on what is a great game

Since the launch of Age of Empires II a year ago, RTS has come a long way in fully-fledged 3D titles like Ground Control, Homeworld and Shogun. So it might seem a bit stale to see an expansion pack in the 'old school' style of Age of Empires. But the venerable title remains 'original and best' and The Conquerors makes a welcome addition.

To kick off with there are a number of gameplay tweaks, such as the ability to garrison troops inside battering rams, readying them for attack while giving them protection from missiles; or being able to queue farms so that you don't have to scurry back, mid-battle, to replant them. Intelligent villagers will get on with harvesting once they've finished a structure and will build more efficiently.

The level settings have been fine-tuned too. The beginner's standard setting is now relatively kind even for the novice, while at the other end, the computer's AI makes a ruthless opponent.

The main addition is five new civilisations, each with a unique unit and technology. There are also four campaigns to choose from: three following the histories of Attila the Hun, El Cid and the Aztec resistance to Cortez. The fourth is a medley of epic battles.

In all, The Conquerors Expansion does exactly what it should: it builds on what is already a great game, rather than trying to change it. With the new civilisations it adds diversity, while the refinements in gameplay iron out some of the previous more irritating aspects and make for a more balanced game.

MATT WHIPP

DETITALS
★★★★
PRICE £24.99 inc VAT
CONTACT Microsoft
www.microsoft.com/games/conquerors
SYSTEM REQUIREMENTS Pentium 166 or equivalent, 32MB of RAM, four-speed CD-ROM, 2MB video card, SVGA, 100MB of disk space, DirectX 7.0a

Rugby 2001

It's taken its time, but it's here with some nice touches

The arrival of a new rugby title from EA Sports has been a long time coming. The last offering was World Cup Rugby 95, but the wait for Rugby 2001 has been worthwhile. The developers at Creative Assembly have really gone to town by applying a full 3D engine and motion capture technologies to give realistically smooth player movements complete with dynamic lighting. Little touches, such as commentary from the 'voice of rugby', Bill McLaren, variable weather conditions and progressive pitch wear, all go towards enhancing the gameplay.

One thing we would say is that you'll probably have to be a rugby fan to stay with the game long enough to master the controls. Once achieved though, the game really opens up. With 20 inter-national teams and over 600 real players, Rugby 2001 isn't short on variety. In addition, there are five competition modes covering the 20-team World Cup, the northern hemisphere Six Nations, the southern hemisphere Tri-Nations competitions, the Bledisloe Cup (Australia vs New Zealand), and the Calcutta Cup where England plays Scotland. A friendly game can also be set up with any two teams.

The competitions are intense and if you haven't become proficient in passing, tackling, set plays, field goal kicking and the odd ruck, then the computer will get the better of you. But you could opt for a more evenly matched contest against friends, as up to four players can take part on one computer.

All in all, Rugby 2001 is probably the most realistic recreation of the sport and it's difficult to see how it wouldn't appeal to both hardcore gamers and rugby enthusiasts.

JALAL WERFALLI

DETITALS
★★★★
PRICE £28.99 inc VAT
CONTACT EA Sports 01932 450 000
www.easports.com
SYSTEM REQUIREMENTS Pentium 200MHz (300MHz Pentium II recommended), 32MB RAM (64MB recommended), 4MB DirectX 7.0-compatible graphics card, DirectX 7.0 compatible sound card, 170MB of hard disk space (450MB recommended, four-speed CD-ROM, Windows 95/98

WIN
one of 10 Brother laser printers

This month we've teamed up with one of the UK's largest suppliers of mono laser printers, Brother, to bring you the chance to win one of 10 of its popular HL-1030 laser printers. Worth £245.58, this high-specification printer provides the answer to all your home and small-office needs.

The new model prints 10 pages per minute, an improvement of two pages per minute on its predecessor. With a powerful 2MB of memory and 600dpi print quality, the HL-1030 ensures output arrives quickly, clearly and effectively. Faster print times and long-life consumables make this model an affordable option by bringing the print cost down to less than 1p per page.

The HL-1030 not only has all the practical benefits of a high-quality printer – it looks good too! The new ergonomic shape ensures the printer fits onto any desktop, and its well-designed control panel ensures ease of use. This HL-1030 can handle a range of different paper sizes while Brother's superior build standards ensure a long life of trouble-free printing.

For further information on the new HL-1030 and for stockists contact Brother on 0845 60 60 626 or visit its website at www.brother-uk.com.

■ *If you'd like the chance to win one of 10 HL-1030s we have to give away, then answer the following simple question.*

What is the Brother HL-1030's print cost per page?

Panrix 700MHz Athlon PC winner
The winner of October's competition is Graham Thorne of Surrey.

How to enter

Fill in the entry coupon on the left and send it to the following address by 30 November 2000:
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Personal Computer World
VNU Business Publications,
32-34 Broadwick Street,
London W1A 2HG

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pcw_competition@vnu.co.uk
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◆ *Competition open to UK residents only*

PCW December 2000
Brother HL-1030 competition entry form

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This competition is open to UK readers of *Personal Computer World*, except for employees (and their families) of VNU Business Publications and Brother. *PCW's* Editor is the sole judge of the competition, and his decision is final. No cash alternative is available in lieu of prizes.

Pandemonium apartments

The growth of population in Pandemonium has led to an acute housing shortage and when Performance Chariots plc wanted to increase its workforce, it decided to build five houses adjoining its factory (see below). From the following clues, can you work out the name, age and occupation of the tenant of each house?

Clues

1 Dexterus' house was next right to that of the bookkeeper, who was more than six years older.

2 The house occupied by the 28-year-old was further to the left than those of both Industrius and the security guard, neither of whom was the youngest of the five.

3 Neither the painter, who was not Radius, nor the tenants on either side of him, was 40.

4 The tenant of number 1 was six years younger than the tenant of number 5.

5 Nitidus lived next left to the wheelwright, who was older, though not next oldest.

6 The combined ages of Rotundus and the joiner equalled those of Radius and the tenant of number 4.

Tenants: Dexterus; Nitidus; Radius; Rotundus; Industrius

Ages: 22; 28; 32; 34; 40

Occupations: Bookkeeper; joiner; painter; security guard; wheelwright

Starting tip: Work out the occupations of the men aged 28 and 22.

Find the solution to this puzzle for a chance to win a copy of Microsoft Encarta Reference Suite 2000.

Send the answer, along with your name and an address where you would like the prize to be mailed, on a postcard to: *PCW* Prize Puzzle (December 2000), VNU House, 32-34 Broadwick Street, London W1A 2HG, or by email to: letters@pcw.co.uk.

Answers should arrive no later than 16 November 2000. Please note that we DO NOT open attachments.

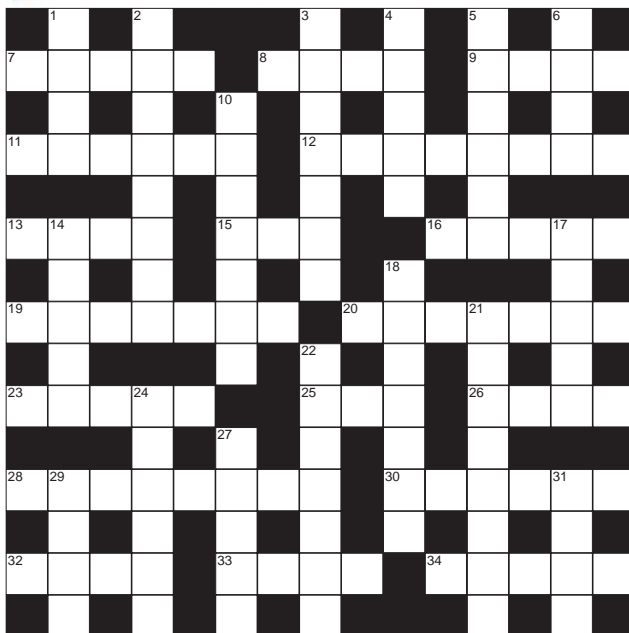| Name: | | | | | |
| Age: | | | | | |
| Occupation: | | | | | |

September's Prize Puzzle answer

The solution to September's puzzle is below. Congratulations to this month's winner Chris Carrington of Kent.

|			D	
G	N	W	R	E
T	A	I	S	
U	K	L	O	

prize crossword

ACROSS

7 Fully inserts a piece of hardware (5)
8 Second W of 15 across (4)
9 Current measures (4)
11 8800, Seventies computer (6)
12 Reverse menu option (8)
13 __ total, error-checking value (4)
15 Internet address component (1,1,1)
16 Computer system overseer (5)
19 Associating a symbol with its description (7)
20 Imitate another software system (7)
23 Inflate a compressed file (5)
25 Electronically charged particle (3)
26 Control statement used in programming (4)
28 Predesigned spreadsheet (8)
30 Look for a file or data (6)
32 Laser-read storage device (4)
33 Extension added to an electric ring main (4)
34 0 or 1, eg (5)

DOWN

1 Back of the foot (4)
2 Joined (8)
3 Take a place at a table (3,4)
4 Monster, brute (5)
5 __ Towers, John Cleese sitcom (6)
6 Like Ben Hur (4)
10 Making beer (7)
14 Classic sci-fi film (5)
17 Group of eight musicians (5)
18 In the midst of (7)
21 Frontier home (3,5)
22 Horrible, ugly (7)
24 Influence (6)
27 Modelling wood (5)
29 __ Blyton, author (4)
31 Short film excerpt (4)
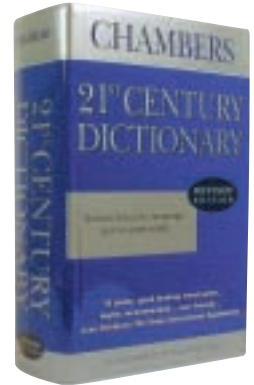
Each month, one lucky *PCW* Crossword entrant wins a copy of the *Chambers 21st Century Dictionary*. This time, it could be you. Send your completed crossword to: '*PCW* November – Prize Crossword', VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive no later than 16 November 2000.
• *Please state clearly on your entry if you do not wish to receive promotional material from other companies.*

Solutions to November's crossword

ACROSS
7 Nanny 8 Nuke 9 RAID 11 Invert 12 Read Only 13 Tele 15 Run 16 A T Bus 19 Listing 20 Megabit 23 Users 25 Bug 26 Tone 28 Argument 30 Normal 32 Tech 33 Chip 34 Index
DOWN
1 Pain 2 Interest 3 Current 4 Delay 5 Try Out 6 Kill 10 Staring 14 Emits 17 Union 18 Begging 21 Altering 22 Abstain 24 Roughs 27 Peach 29 Rued 31 Area

Remember when Windows 3.0 was the height of high-tech? PCW takes a trip down memory lane

20 YEARS AGO ### December 1980

'Yes, but is it art?' That was the quote accompanying the front cover of *PCW* back in 1980, referring to whether the words computer and art could be used in the same breath. Illustrating this theme was Malcolm Banthorpe with a collection of renditions from his scrapbook. Using programs that generated moiré patterns, three-dimensional plots and designs based on the well-known Lissajous patterns, Malcolm went on to describe how to capture this artwork directly from the CRT screen using a conventional camera.

With Christmas fast approaching the electronic goodies of yesteryear were not exactly on a par with the PDAs reviewed in this month's issue, but they did provide hours of fun. After a trip to Hamley's of Regent Street, it was down to David Tebbutt, Peter Rodwell and Dick Pountain to give their opinions on 17 electronic toys. A particular favourite was the Sindy Cooker. Placing the relevant kitchen utensil on one of the four hobs triggered realistic sound effects for the kettle, saucepan, frying pan and pressure cooker. Datacar – a directionally programmable replica of the BMW 3.5CSL – was also a much-loved toy, especially by Peter who sent it careering into a carefully arranged toy display. A handheld version of Space Invaders was also a popular hit at Hamleys.

15 YEARS AGO ### December 1985

Fifteen years ago, the *PCW* front cover was adorned by IBM's JX. This machine signalled IBM's intention to re-enter the home and education market after the PCjr met with an unlamented end. The JX was initially launched in Australia and our counterparts over there managed to get hold of one for an exclusive benchtest.

The JX was the first 'English-speaking' IBM PC to use 3.5in floppy drives, ahead of the much-rumoured Clamshell lap-held and the much-delayed PC2. In fact, the JX had avoided the PCjr's big problems: low memory capacity, rubber keyboard and lack of PC software compatibility. Consequently, the reviewer Ron Dunn was so impressed with this 4.77MHz Intel 8088-driven PC that he considered going out and buying one for his own network.

Meanwhile, on the other side of the globe, David Ahl brought us the news that the US wholesale price of the PCjr had dropped by $174 to a street price in the $300-400 range – a bargain if the computer met your needs. Other news included the activities of five ex-Atari executives who all went on to sell high-tech animated story-telling toys such as Teddy Ruxpin, a bear that blinked and moved his nose and mouth realistically as he sang and told stories.

With the 1984 Olympics fresh in his memory, *PCW*'s Stephen Applebaum took a closer look at US Gold's Summer Games II and Winter Games. Although the graphics were not up to the standards of today's offerings such as Sydney 2000, the frantic joystick yanking that playing these games entailed kept us all happy.

10 YEARS AGO ### December 1990

A decade ago the front cover was dominated by the arrival of three new NeXT systems on the market. Trying to avoid the squeeze brought on by DOS domination of the market, NeXT diversified over a range of platforms. *PCW* reviewer Guy Swarbrick considered the NeXTstation Colour to be impressive, but regarded the NeXTdimension as mind-blowing. Guy believed that NeXT had a place in the future, although it looked set to become a niche machine in the graphic art and video industries.

Also put to the benchtest was the Dell 433TE, a system aimed at convincing corporate users that Dell machines were as capable as minicomputers. At £10,000 the 433TE was expensive even by today's standards and the PC had a lot to achieve. Fortunately *PCW* was on Dell's side, concluding that it had produced a highly professional PC server.

December 1990 also saw the results of *Personal Computer World*'s awards, the magazine's first annual award ceremony. There were three categories: hardware, software and special awards, with winners and runners-up in sub-categories. These included best entry-level system, won by the Macintosh Classic, best portable system, with the Sharp PC-6200 as top dog, and best peripherals (printed output), won by Qume CrystalPrint Express. Best desktop publishing software was Quark Xpress 3.0 and best utility was laplink III. The top award for the most influential or innovative product went to Windows 3.0, which received countless votes from *PCW* readers. It also swept the board with the judges, with the whole panel of experts unanimously in favour.

5 YEARS AGO ### December 1995

PC-TVs were cited as the next big growth area for PCs on the front cover of *PCW* five years ago. Aimed at making computing more accessible to the wider public, multimedia PCs were the result of a dip in the sale of office PCs and market research that anticipated phenomenal growth in the sales of home PCs. The research hit the mark, although at the time PC manufacturers had very different ideas on what consumers wanted from their multimedia home PC. *PCW* reviewed five contrasting models, with Olivetti's Envision 400 grabbing the Editor's Choice award due to its high 'wow' factor. With a sleek black exterior, lack of a monitor (in favour of the TV being put to use) and a cordless keyboard, the PC was designed so it would not look out of place in the living room. Apple's Mac Performa 5200CDTV, was a close second, impressing the *PCW* team with its ease of use and all-in-one unit.

Michael Hewitt sounded off on the then relatively new subject of emails. He voiced his dismay at British business for failing to pick up on the major evolutionary leap in business communications – the email. Michael observed that businesswomen appeared to have no problem with this leap forward in communications, and proposed that British businessmen's inability to receive or send mail electronically could be because they viewed it as a challenge to their masculinity. To these men, he suggested, the lack of a secretary in the message sending/receiving equation was too far-fetched to consider email a feasible business option.

CLAIRE MORLEY AND JALAL WERFALLI

Atari 400/800

The company that invented arcade games was also talented when it came to home computers

Atari undoubtedly has one of the finest pedigrees in the business. We can thank Atari founder Nolan Bushnell for Pong, the first great arcade game. Believe it or not, his follow-up, Breakout, was programmed by a young Steve Jobs with the after-hours help of Stephen Wozniak before the pair got together to form Apple Computer. Then there was every kid's fantasy games console, the Atari VCS, arriving in 1977 with the first home version of Space Invaders in the same year that *Star Wars* was released. Golden years indeed.

In 1978, Atari was working on a new high-end video game system when the new CEO, Ray Kassar, decided Apple really had the right idea. Atari switched its efforts from consoles to the home computer market and began work on project Oz. Later known in prototype form as Candy and Colleen (allegedly after well-endowed Atari secretaries), the Atari 400 and 800 finally emerged in 1979 and hit the UK in October the following year.

The two were based around the same architecture, featuring a 6502 8bit processor running at 1.79MHz in NTSC regions and 1.77MHz in PAL, accompanied by 10KB of ROM. Both drove their displays at 320 x 192 pixels in 16 colours, although where the 400 only had an RF TV output, the 800 also boasted a composite video connection.

Memory was where they really differed internally, with the 400 and 800 named after the amount of RAM they were intended to be fitted with – 4KB and 8KB of RAM respectively. At launch however, the machines were fitted with double the RAM as standard, which later increased again to 16KB and 48KB respectively.

Despite being pretty capable all-round machines with word processor,

finance and educational titles, Atari had the forethought to also make them great games platforms. Both were fitted with a cartridge port (two on the 800), no fewer than four joystick ports and four sound voices. However, the most impressive aspect of the machines was that they were among the first to boast 'player missile graphics', later known as sprites. Atari played its trump arcade card and released many of its most popular games.

Better still, the joystick ports could not only handle any controller developed for the earlier VCS console, but also external modems, hard-drive interfaces and robot arms developed by third parties. Atari itself

The Atari 400 (above) and 800 (right) were capable home computers as well as great games platforms

produced a science lab kit called Atari Lab, which connected to these ports and measured light, temperature and sound.

Where the Atari 400 and 800 really differed, however, was in the physical design department. The 400 employed a child-proof membrane keyboard later made infamous by the Sinclair ZX80 and ZX81 computers. It's unlikely that any typing records were broken on such keyboards, but they did stop parents worrying about kids swallowing loose keys or ruining the keyboard by spilling drinks all over it.

The Atari 800 was a much more serious contender, with a full-travel typewriter keyboard and proper expansion capabilities, thanks to the four slots hiding under a hinged lid on the top. While initially intended for

memory upgrades, the slots were also used to upgrade the OS and offer greater video capabilities. As legend has it, they were even able to offer third-party internal modem capability – remember, these were the days of external acoustic couplers, into which you had to insert your telephone's handset if you wanted to listen to gossip on bulletin boards.

The Atari 400 and 800 were on sale between 1979 and 1983, after which the new XL range arrived. First came the ill-fated 1200XL that, despite having a superior keyboard actually had sufficient downsides for many users to stick with the older 800. Later the 600XL and 800XL arrived, which were essentially versions of the original 400 and 800 in different packaging with a new parallel bus interface. This interface allowed users to connect the optional Atari 1090XL expansion system featuring five card slots. Sadly the number of joystick ports had been cut from four to two.

By 1984, ex-Commodore head Jack Tramiel had taken over the reins of Atari and cancelled the development of the XL platform in favour of the new and improved XE (XL line Enhanced) range. Sadly the XE models weren't massively different from the 800XL that preceded them and, despite being available for several years, took a back seat thanks to a 16bit computer project using a Motorola 68000 CPU and some cunning 32bit internals. This 16/32 system was launched worldwide as the Atari ST in 1985, with Tramiel's slogan 'Power without the price'.

The fantastic original 400 and 800 systems were groundbreaking for the time, particularly the powerful and expandable 800. It's fair to say that both kicked off the serious home computer market several years before the Spectrums and BBCs came along.

GORDON LAING